

ATTACHMENT A

Flow Frequency Memorandum and 303(d) Fact Sheets

MEMORANDUM

**DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060**

SUBJECT: Flow Frequency Determination / 303(d) Status
Omega Protein, Inc. – VA0003867

TO: Laura Galli

FROM: Jennifer Palmore, P.G.

DATE: January 7, 2016

COPIES: File

The Omega Protein, Inc. facility is located near Reedville in Northumberland County. Outfall 002 discharges to an unnamed tributary (UT) of Cockrell Creek at rivermile 7-XAN000.14 and outfall 995 discharges to Cockrell Creek at rivermile 7-COC001.00. Flow frequencies have been requested for use in developing effluent limitations for the VPDES permit.

Cockrell Creek and its tributary are both tidally influenced. Flow frequencies cannot be determined for tidal waters, therefore the previously-determined dilution ratios (002: van Soestbergen, 9/17/1998; 995: default ratios) should be used to evaluate the effluent's impact on the waterbody. The Virginia Water Quality Standards classify Cockrell Creek as an estuarine waterbody; therefore, the Aquatic Life Saltwater criteria should be applied.

In the 2012 305(b)/303(d) Integrated Water Quality Assessment Report, both segments were considered Category 5D waters ("The Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.") The fact sheets are attached. The Aquatic Life Use is impaired due to inadequate submerged aquatic vegetation (SAV) in the Chesapeake Bay mesohaline segment (CB5MH); estuarine bioassessment is included as a non-impairing observed effect. The Fish Consumption Use is impaired due to a VDH Fish Consumption Advisory for PCBs; arsenic is an observed effect due to a screening value exceedance. The Recreation Use is impaired due to enterococci exceedances. The Wildlife Use is fully supporting. An administrative shellfish condemnation is in effect for Cockrell Creek; therefore, the Shellfish Use was considered removed for the mainstem. The administrative closure expanded during the 2012 cycle and incorporated the UT; however, the UT mistakenly remained impaired for the Shellfish Consumption Use.

In the draft 2014 Integrated Report, both creeks are considered Category 5D waters. The Aquatic Life Use remains impaired due to inadequate SAV in the CB5MH estuary; estuarine bioassessment is an observed effect. The Fish Consumption Use is impaired due to a VDH Fish Consumption Advisory for PCBs; arsenic is an observed effect due to a screening value exceedance. The Recreation Use is impaired due to enterococci exceedances. The Wildlife Use is fully supporting. In addition, the Shellfish Use is considered removed for both segments.

Water quality data from monitoring station 7-COC001.61 is attached. The station is located on Cockrell Creek at the dock at the end of Main Street in Reedville, which is approximately 0.6 mile upstream of the facility.

Flow Frequency Determination
Omega Proteins, Inc. – VA0003867
January 7, 2016
Page 2

During a 1979 modeling effort by VIMS, the dischargers on Cockrell Creek were allocated 5,000 lbs/day of cBOD₅ “in order that 5.0 mg/L of DO will be maintained in the upper layer of that receiving stream”. As 5.0 mg/L was the dissolved oxygen water quality standard at the time, Cockrell Creek was considered to be fully allocated and is therefore considered a Tier 1 water.

The Chesapeake Bay TMDL, which was approved by the EPA on 12/29/2010, allocates loads for total nitrogen, total phosphorus, and total suspended solids to protect the dissolved oxygen and submerged aquatic vegetation acreage criteria in the Chesapeake Bay and its tidal tributaries. The facility is considered a significant nutrient discharger in the CB5MH estuary and was assigned the following wasteload allocations:

- 21,213 lbs/year of total nitrogen
- 1,591 lbs/year of total phosphorus
- 352,836 lbs/year of total suspended solids

The discharge is within the study area for the Cockrell Creek Shellfish TMDL, which was approved by the EPA on 12/8/2008 and by the SWCB on 4/28/2009. The facility was originally assigned a fecal coliform wasteload allocation of 9.97E+09 MPN/day to address the Shellfish Use impairment. In addition, the discharge received an enterococci wasteload allocation of 2.49E+10 MPN/day in order to address the Recreation Use impairment. In 2014, the wasteload allocations were reassigned to future growth using DEQ's track-and-roll modification process and the facility is not currently assigned a wasteload allocation for bacteria.

If you have any questions concerning this analysis, please let me know.

2014 Fact Sheets for 303(d) Waters

RIVER BASIN:	Chesapeake Bay/Atlantic/Small Coastal Basins	HYDROLOGIC UNIT:	02080102
STREAM NAME:	Cockrell Creek		
TMDL ID:	C01E-08-BAC	2014 IMPAIRED AREA ID:	CB-CB5MH
ASSESSMENT CATEGORY:	4A	TMDL DUE DATE:	2020
IMPAIRED SIZE:	0.4697 - Sq. Mi.	Watershed:	VAP-C01E
INITIAL LISTING:	2008		
UPSTREAM LIMIT:	Upstream condemnation boundary		
DOWNTSTREAM LIMIT:	Downstream condemnation boundary		

Described in VDH Notice and Description of Shellfish Condemnation Number 012-002A, 9/22/2005.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: Enterococci

Due to monitoring around the Omega Protein facility during development of the Cockrell Creek Shellfish TMDL, the segment was listed for the Recreation Use due to enterococci exceedances at several stations. The enterococci TMDL is due in 2020, however it was addressed during the Shellfish TMDL, which was approved by the EPA on 12/8/08 and by the SWCB on 4/28/09. The segment is considered Category 4A.

Note: monitoring at downstream station 7-COC000.27 is acceptable.

IMPAIRMENT SOURCE Nonpoint Sources, Industrial Facility

The report attributes the bacteria to nonpoint sources in the watershed and to discharges related to the Omega Protein facility.

RECOMMENDATION: Implementation

2014 Fact Sheets for 303(d) Waters

RIVER BASIN:	Chesapeake Bay/Atlantic/Small Coastal Basins	HYDROLOGIC UNIT:	02080102
STREAM NAME:	Cockrell Creek - DELIST		
TMDL ID:	C01E-08-SF	2014 IMPAIRED AREA ID:	CB-CB5MH
ASSESSMENT CATEGORY:	NA	TMDL DUE DATE:	2010
IMPAIRED SIZE:	0.3086 - Sq. Mi.	Watershed:	VAP-C01E
INITIAL LISTING:	1998		
UPSTREAM LIMIT:			
DOWNTSTREAM LIMIT:	Downstream condemnation boundary		

Portion of VDH Notice and Description of Shellfish Condemnation Number 012-002A, 9/22/2005 that is not administratively condemned.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Shellfishing Use - Not Applicable

IMPAIRMENT:

VDH Shellfish Restriction

Shellfishing Use Removed 2014 - Admin. Condemned - DSS Cond #012-002A, 9/22/2005

Cockrell Creek was listed as impaired of the Shellfish Consumption Use during the 1998 cycle due to VDH-DSS condemnation 2A, 9/14/1993. The area is currently addressed in condemnations 012-002A, 9/22/2005. The bacterial TMDL for Cockrell Creek was developed during the 2010 cycle and was approved by the EPA on 12/8/2008 and by the SWCB on 4/28/2009. However, it was subsequently determined that a portion of section A was considered an administrative closure by VDH; therefore the Shellfish Use is considered to be removed and the section was delisted. The impaired section remained as Category 4A.

The administrative portion expanded during the 2012 cycle and now fully incorporates 012-002A, 9/22/2005; however, it was mistakenly still designated as impaired. The segment will be delisted in the 2014 cycle and the use is considered removed.

IMPAIRMENT SOURCE

The report attributes the bacteria to nonpoint sources in the watershed and to discharges related to the Omega Protein facility. The condemnation is considered an administrative closure.

RECOMMENDATION:

Delist

2014 Fact Sheets for 303(d) Waters

RIVER BASIN:	Chesapeake Bay/Atlantic/Small Coastal Basins	HYDROLOGIC UNIT:	02080102
STREAM NAME:	Chesapeake Bay and Tidal Tributaries		
TMDL ID:	C01E-17-PCB	2014 IMPAIRED AREA ID:	CB-CB5MH
ASSESSMENT CATEGORY:	5A	TMDL DUE DATE:	2018
IMPAIRED SIZE:	~1,462 - Sq. Mi.	Watershed:	VAP-C01E
INITIAL LISTING:	2006		
UPSTREAM LIMIT:	VA-MD State Line		
DOWNTSTREAM LIMIT:	Mouth		

Chesapeake Bay mainstem and its small coastal tidal tributaries

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: PCBs

The Chesapeake Bay and its small coastal tidal tributaries are included under the 12/13/2004 VDH Fish Consumption Advisories for PCBs. No more than 2 meals/month are recommended of anadromous (coastal) striped bass.

Also, VDH issued additional fish consumption advisory for PCBs in the Mobjack Bay and its tributaries, particularly the East, West, and Ware Rivers (on 12/13/2004) and in the Piankatank River from Rt. 17 to Deep Point Boat Landing (10/7/2009). No more than two meals/month of gizzard shad are recommended.

The advisories are based on the results of DEQ's fish tissue monitoring program, which show elevated PCBs levels in several monitoring sites within the basin, including:

7-GWR007.97 in the Great Wicomico River
7-COC000.40 in Cockrell Creek
7-IND001.80 in Indian Creek
7-DYM000.00 in Dymer Creek
7-PNK019.85 in the Piankatank River
7-MLF002.45 in Milford Haven
7-WIN000.88 in Winter Harbor
7-EST002.65 in the East River
7-NOR003.65 in the North River
7-WAR005.77 in the Ware River

IMPAIRMENT SOURCE Unknown

Source is considered unknown.

RECOMMENDATION: Problem Characterization

2014 Fact Sheets for 303(d) Waters

RIVER BASIN: Chesapeake Bay/Atlantic/Small Coastal Basins **HYDROLOGIC UNIT:** 02080102

STREAM NAME: Chesapeake Bay and Tributaries

TMDL ID: CB5MH-SAV-BAY **2014 IMPAIRED AREA ID:** CB-CB5MH

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: - Sq. Mi. **Watershed:** VAP-C01E

INITIAL LISTING: 2006

UPSTREAM LIMIT:

DOWNTSTREAM LIMIT:

The Chesapeake Bay segment 5 Mesohaline estuary (CB5MH)

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Shallow Water Subuse - Not Supporting

IMPAIRMENT: Aquatic Macrophytes

The Chesapeake Bay water quality standards were adopted during the 2006 cycle. The CB5MH segment, which is a portion of the mesohaline Chesapeake Bay estuary, fails the Shallow Water Subuse's submerged aquatic vegetation acreage standards. There is insufficient data to assess the water clarity acreage standard.

The Chesapeake Bay TMDL was approved by the EPA on 12/29/2010; therefore, CB5MH is considered Category 4A.

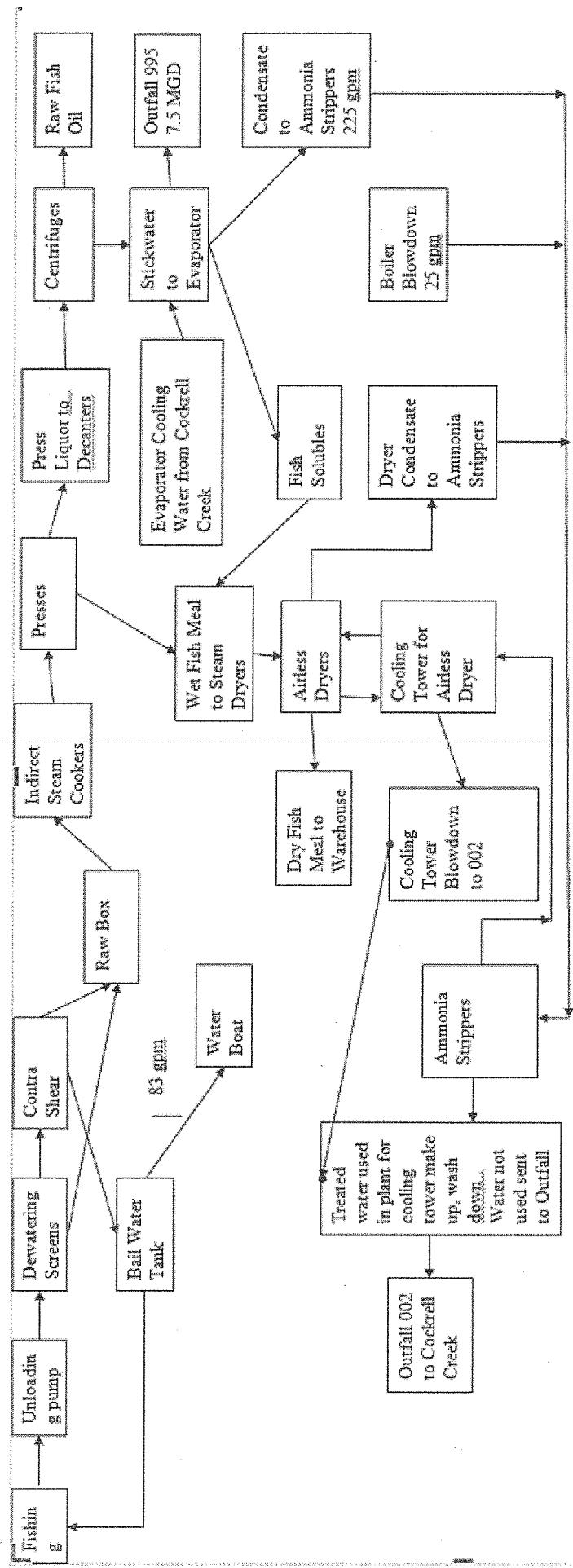
IMPAIRMENT SOURCE Nonpoint Sources, Point Sources

Total nitrogen, total phosphorus, and total suspended solids were allocated to point and nonpoint sources throughout the Bay watershed.

RECOMMENDATION: Implementation

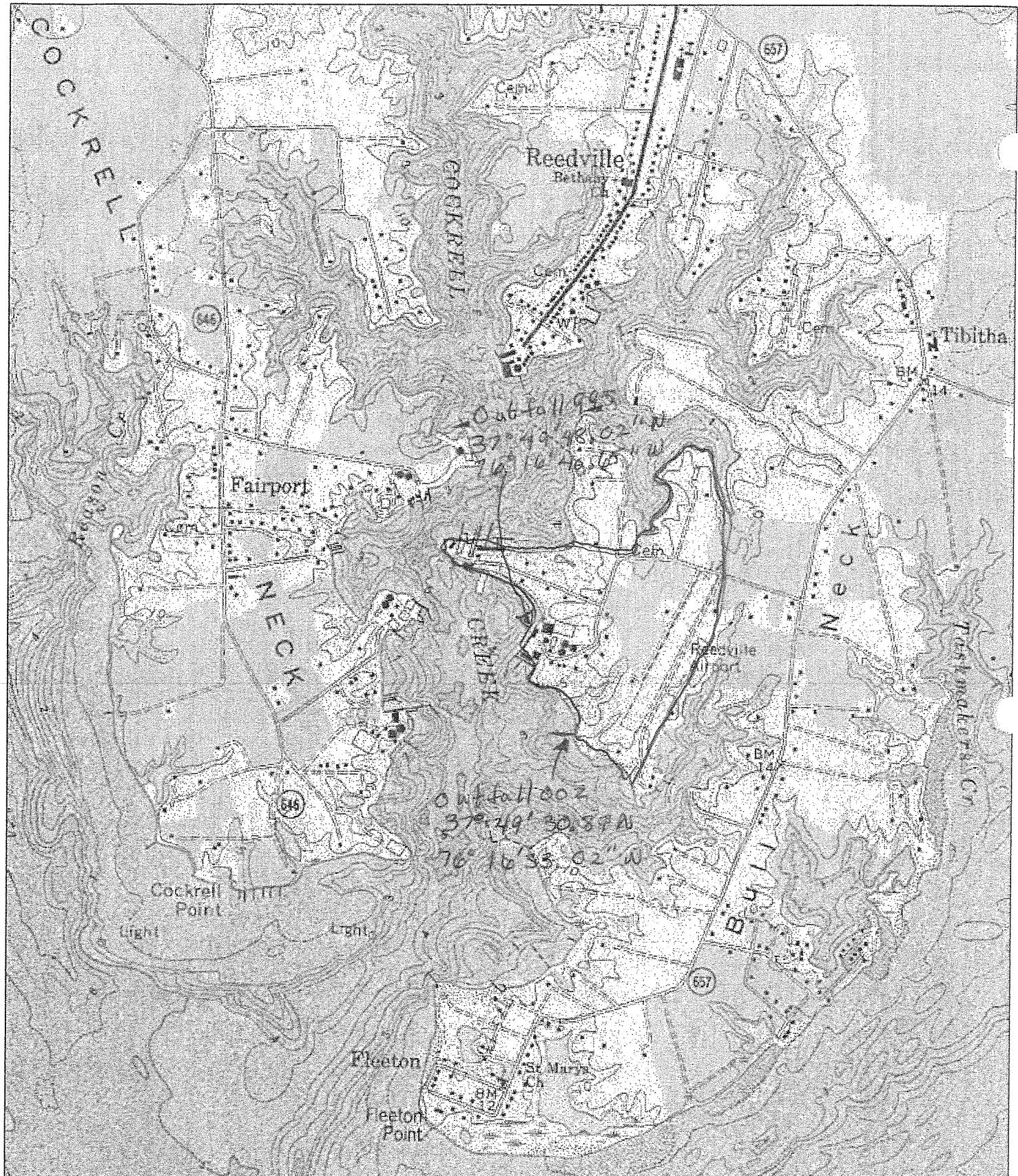
ATTACHMENT B

Facility Operations Diagram



ATTACHMENT C

Topographic Map



0 0.5 Mi
0 2000 Ft

Map provided by MyTopo.com

Reedville Topo

ATTACHMENT D

Ambient Monitoring Data for 7-COC001.61

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity
7-COC001.61	10/21/1993	S	0.3	19.1	7.87	8			18
7-COC001.61	12/13/1993	S	0.3	6.02	7.8		0.57		
7-COC001.61	2/16/1994	S	0.3	2.7	8.19	14.4			13
7-COC001.61	4/6/1994	S	0.3	12.4	8.48	11.3			10
7-COC001.61	6/7/1994	S	0.3	23.1	8.08	7.2			10
7-COC001.61	8/9/1994	S	0.3	24.6	8.1	8.2			13.5
7-COC001.61	12/15/1994	S	0.3	7.7	8.08	9.5			16.5
7-COC001.61	2/9/1995	S	0.3	0.8	8.85	12.8			16
7-COC001.61	6/12/1995	S	0.3	26.7	7.83	7.15			17.2
7-COC001.61	8/11/1995	S	0.3	28.45	8.24	7.07			19.1
7-COC001.61	8/11/1995	M	1	28	8.2	6.44			19.3
7-COC001.61	8/11/1995	B	4	26.85	7.88	3.3			19.3
7-COC001.61	8/11/1995	M	3	27	7.96	3.85			19.3
7-COC001.61	9/13/1995	S	0.3	24.98	8.05	6.36			22
7-COC001.61	12/11/1995	S	0.3	4.09	7.8	11.06			21.2
7-COC001.61	3/18/1996	S	0.3	7.73	7.57	11.09			14.3
7-COC001.61	6/20/1996	S	0.3	29.5	8.65	10.31			11.8
7-COC001.61	9/19/1996	S	0.3	22.97	7.63	6.4			13.2
7-COC001.61	12/12/1996	S	0.3	6.61	7.75	11.73			12.2
7-COC001.61	3/10/1997	S	0.3	9.74	8.29	12.37			9.9
7-COC001.61	6/5/1997	S	0.3	20.56	7.66	8.32			12.9
7-COC001.61	7/28/1997	S	0.3	28.53	7.72	6.62			15.2
7-COC001.61	9/16/1997	S	0.3	26.33	7.82	7.42			17
7-COC001.61	11/17/1997	S	0.3	10.03	8.05	8.16			19.1
7-COC001.61	1/13/1998	S	0.3	7.83	8	8.52			20
7-COC001.61	3/11/1998	S	0.3	8.29	8.38	11.69			13.2
7-COC001.61	5/14/1998	S	0.3	15.98	7.57	6.85			10.4
7-COC001.61	7/13/1998	S	0.3	27.2	8.26	6.83			12.2
7-COC001.61	8/24/1998	S	1	28.4	8.07	8.28			16.3
7-COC001.61	9/8/1998	M	1	27.02	7.9	7.28			18.8
7-COC001.61	9/8/1998	B	2	27.02	7.86	7.35			18.8
7-COC001.61	9/8/1998	S	0.3	27.01	7.93	7.23			18.8
7-COC001.61	9/15/1998	S	0.3	26.08	8.15	8.33			15.6
7-COC001.61	9/21/1998	B	2.7	25.85	7.62	3.11			16.7
7-COC001.61	9/21/1998	M	2	25.87	7.79	4.12			16.6
7-COC001.61	9/21/1998	M	1	26.06	8.09	6.2			16.6
7-COC001.61	9/21/1998	S	0.3	26.61	8.17	7.53			16.4
7-COC001.61	10/8/1998	S	2.9	20.94	7.87	6.17			17.3
7-COC001.61	10/8/1998	M	1	21.12	8.09	7.47			17.9
7-COC001.61	10/8/1998	S	0.3	21.12	8.09	7.47			17.9
7-COC001.61	10/8/1998	B	2	21.03	8.06	7.37			17.8
7-COC001.61	10/22/1998	B	1.7	17.73	7.64	6.77			20.5
7-COC001.61	10/22/1998	M	1	17.76	7.7	6.61			20.5
7-COC001.61	10/22/1998	S	0.3	17.74	7.71	6.65			20.5
7-COC001.61	11/5/1998	B	2.1	13.41	7.68	7.25			21.8
7-COC001.61	11/5/1998	S	0.3	13.41	7.7	7.22			21.8
7-COC001.61	11/5/1998	M	1	13.41	7.7	7.25			21.8
7-COC001.61	11/16/1998	S	0.3	12.2	8.02	10.34			19
7-COC001.61	11/19/1998	B	2.7	12.44	8.05	11.55			17.6
7-COC001.61	11/19/1998	S	0.3	12.54	8.28	12			17.5
7-COC001.61	11/19/1998	M	1	12.34	8.27	11.74			17.5
7-COC001.61	11/19/1998	M	2	12.43	8.2	11.37			17.5
7-COC001.61	1/13/1999	S	0.3	3.96	7.58	14.01			21.5
7-COC001.61	3/15/1999	S	0.3	5.22	7.7	10.4			22.1
7-COC001.61	5/10/1999	S	0.3	22.35	8.02	9.4			16
7-COC001.61	5/10/1999	B	1.4	22	8.02	9.34			16
7-COC001.61	5/10/1999	S	1	22.2	8.02	8.9			16
7-COC001.61	5/12/1999	S	0.3	22.41	8.42	9.7			16.8
7-COC001.61	5/24/1999	S	1	22.98	7.92	6.78			18
7-COC001.61	5/24/1999	B	1.4	22.96	7.81	6.63			18
7-COC001.61	5/24/1999	S	0.3	22.98	7.92	6.75			18
7-COC001.61	6/7/1999	S	0.3	26.82	8.54	8.69			16.5
7-COC001.61	6/7/1999	S	1	25.73	8.55	8.09			16.7

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity
7-COC001.61	6/21/1999	B	1.5	22.01	8.36	8.61			17.1
7-COC001.61	6/21/1999	S	0.3	22.03	8.39	8.57			17.1
7-COC001.61	6/21/1999	S	1	22.03	8.37	8.51			17.1
7-COC001.61	7/1/1999	S	1	27.2	8.2	6.7			20
7-COC001.61	7/1/1999	S	0.3	27.6	8.25	7.5			19.6
7-COC001.61	7/13/1999	S	0.3	25.41	8.13	5.34			17.3
7-COC001.61	7/22/1999	B	1.4	27.95	8.19	4.36			17.7
7-COC001.61	7/22/1999	S	0.3	28.22	8.54	8.27			17.3
7-COC001.61	7/22/1999	S	1	28.07	8.35	6.01			17.5
7-COC001.61	8/4/1999	S	0.3	29.96	8.51	9.31			17.8
7-COC001.61	8/4/1999	S	1	29.94	8.49	9.22			17.9
7-COC001.61	8/19/1999	S	0.3	28.98	8.39	7.53			24
7-COC001.61	8/19/1999	S	1	28.95	8.37	7.5			24
7-COC001.61	9/2/1999	S	0.3	21.51	8.23	8.37			21.4
7-COC001.61	9/2/1999	S	1	21.5	8.22	8.35			21.4
7-COC001.61	9/14/1999	S	0.3	25.52	7.99	8.04			17.7
7-COC001.61	9/29/1999	S	0.3	23.43	7.98	7.49			22.8
7-COC001.61	9/29/1999	S	1	23.01	7.92	7.12			23.1
7-COC001.61	9/29/1999	B	1.7	22.83	7.85	6.74			23.4
7-COC001.61	10/6/1999	S	0.3	20.43	8.06	7.96			20
7-COC001.61	10/6/1999	S	1	20.17	8.06	7.89			20.7
7-COC001.61	10/21/1999	S	0.3	17.04	7.7	8.17			17.5
7-COC001.61	10/21/1999	B	1.1	17.11	7.69	7.93			17.5
7-COC001.61	11/8/1999	S	0.3	13.66	7.95	7.06			19.5
7-COC001.61	1/24/2000	S	0.3	1.28	7.87	11.74			19.8
7-COC001.61	3/16/2000	S	0.3	12.61	8.16	10.28			17.1
7-COC001.61	5/18/2000	S	0.3	25.06	8.21	8.25	8.2		13.2
7-COC001.61	5/23/2000	S	0.3	21.55	8.16	8.28			14.01
7-COC001.61	5/23/2000	S	1	21.54	8.15	8.24			14.01
7-COC001.61	6/14/2000	S	0.3	25.75	8.01	6.07			14
7-COC001.61	6/14/2000	S	1	25.69	7.98	4.46			14
7-COC001.61	6/14/2000	M	2.5	25.34	7.83	3.66			14.1
7-COC001.61	6/14/2000	M	2	25.52	7.86	4.78			14.1
7-COC001.61	7/6/2000	S	0.3	29.91	8.29	7.44			13.8
7-COC001.61	7/6/2000	B	1	28.89	8.22	6.16			14
7-COC001.61	7/12/2000	S	0.3	27.9	8.45	7.65	8.2		14.51
7-COC001.61	8/1/2000	B	1	28.58	8.54	9.62			13
7-COC001.61	8/1/2000	S	0.3	28.8	8.57	10.15			13
7-COC001.61	9/5/2000	S	0.3	25.56	7.51	3.83			14.3
7-COC001.61	9/5/2000	B	1	25.6	7.5	3.83			14.2
7-COC001.61	9/7/2000	S	0.3	23.47	7.57	7.14			14.4
7-COC001.61	10/26/2000	S	0.3	18.76	7.99	8.15			16.2
7-COC001.61	10/26/2000	B	1	18.36	7.99	8.15			16.2
7-COC001.61	11/7/2000	S	0.3	13.61	8.14	9.77			16.42
7-COC001.61	1/3/2001	S	0.3	1.05	7.9	12.21			20.5
7-COC001.61	3/7/2001	S	0.3	5.22	7.95	10.81			17.02
7-COC001.61	5/15/2001	S	0.3	21.5	7.77	6.6			15.6
7-COC001.61	7/17/2001	S	0.3	28.42	8.14	8.19			15.86
7-COC001.61	9/24/2001	S	0.3	24.98	7.79	8.51			17.74
7-COC001.61	11/19/2001	S	0.3	13.57	7.88	9.15			19.6
7-COC001.61	1/15/2002	S	0.3	5.55	7.51	11.81			20.8
7-COC001.61	4/1/2002	S	0.3	13.8	8.06	8.58			19.61
7-COC001.61	5/1/2002	S	0.3	20.31	8.1	9.79			18.52
7-COC001.61	8/28/2002	S	0.3	26.41	7.37	4.5			19.23
7-COC001.61	10/28/2002	S	0.3	15.96	7.49	7.86			21.68
7-COC001.61	2/5/2003	S	0.3	3.64	7.89	13.79			15.93
7-COC001.61	4/29/2003	S	0.3	19.64	7.96	9.79			10.9
7-COC001.61	6/11/2003	S	0.3	25.29	8.29	9.16			11.97
7-COC001.61	8/4/2003	S	0.3	28.55	8.11	7.52			12.55
7-COC001.61	10/6/2003	S	0.3	19.7	7.85	7.54			12.65
7-COC001.61	12/15/2003	S	0.3	6.3	8.44	12.7			11.8
7-COC001.61	3/11/2004	S	0.3	7.99	8	11.51			12.22
7-COC001.61	4/27/2004	S	0.3	19.55	8.58	10.26			11.3

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity
7-COC001.61	6/8/2004	S	0.3	27.75	8.02	8.1			11.95
7-COC001.61	6/24/2004	S	0.3	26.54	8.42	7.15			12.58
7-COC001.61	7/8/2004	S	0.3	28.81	8.14	5.83			13.08
7-COC001.61	7/28/2004	S	0.3	27.63	7.98	7.66			12.14
7-COC001.61	8/16/2004	S	0.3	24.93	7.77	5.2			13.08
7-COC001.61	9/20/2004	S	0.3	21.63	7.96	8.18			13.83
7-COC001.61	9/27/2004	S	0.3	23.93	8.45	8.56			13.2
7-COC001.61	10/20/2004	S	0.3	16.97	8.07	8.24			11.39
7-COC001.61	11/18/2004	S	0.3	10.74	8.32	12.82			11.71
7-COC001.61	11/29/2004	S	0.3	11.14	8.61	11.6			12.6
7-COC001.61	1/31/2005	S	0.3	0.49	8.24	13.41			10.87
7-COC001.61	3/30/2005	S	0.3	13.56	8.27	12.69			11.14
7-COC001.61	5/9/2005	S	0.3	16.88	8.31	10.8			9.83
7-COC001.61	5/23/2005	S	0.3	21.25	8.46	6.5			10.77
7-COC001.61	6/9/2005	S	0.3	27.02	7.69	6.38			10.58
7-COC001.61	6/28/2005	S	0.3	29.51	8.31	7.13			11.9
7-COC001.61	7/18/2005	S	0.3	30.83	8.16	6.7			12.79
7-COC001.61	8/8/2005	S	0.3	31.16	8.54	9.36			13.96
7-COC001.61	9/13/2005	S	0.3	27.44	8.04	6.37			16.74
7-COC001.61	9/13/2005	S	0.3	27.44	8.04	6.37			16.74
7-COC001.61	10/25/2005	S	0.3	16.26	7.74	7.75			17.57
7-COC001.61	11/8/2005	S	0.3	16.22	8.05	8.75			16.23
7-COC001.61	11/16/2005	S	0.3	15.65	8.23	9.78			17.55
7-COC001.61	2/2/2006	S	0.3	6.84	8.31	12.13			13.72
7-COC001.61	5/23/2006	S	0.3	21.2	8	7.7			14.9
7-COC001.61	5/30/2006	S	0.3	26.3	8	7.6			15.3
7-COC001.61	6/28/2006	S	0.3	27.7	8.1	6.4			15.2
7-COC001.61	7/20/2006	S	0.3	31.3	8.3	7			15.4
7-COC001.61	7/26/2006	S	0.3	28.7	8.2	7.6			15.3
7-COC001.61	8/28/2006	S	0.3	29.7	8.2	7			16
7-COC001.61	8/30/2006	S	0.3	29.1	8.2	6.9			18.6
7-COC001.61	9/14/2006	S	0.3	23.2	7.3	4.2			17.6
7-COC001.61	10/25/2006	S	0.3	13.8	7.7	8.9			16.9
7-COC001.61	11/20/2006	S	0.3	12.5	7.9	10.3			16.6
7-COC001.61	11/27/2006	S	0.3	10.4	8.1	11.8			11.2
7-COC001.61	2/22/2007	S	0.3	5.4	7.6	14			13.1
7-COC001.61	4/9/2007	S	0.3	12.4	8.4	10.8			12.6
7-COC001.61	6/5/2007	S	0.3	25.3	8.1	8.7			13
7-COC001.61	8/23/2007	S	0.3	26.7	7.9	7.2			16.6
7-COC001.61	10/30/2007	S	0.3	17.1	7.5	7.8			19
7-COC001.61	12/20/2007	S	0.3	6.7	8.2	11.1			20.1
7-COC001.61	2/27/2008	S	0.3	7.1	8.2	5.3			16.8
7-COC001.61	2/29/2008	S	0.3	6.3	7.3	11.7			16.1
7-COC001.61	4/23/2008	S	0.3	17.7	8.3	8.6			12
7-COC001.61	6/23/2008	S	0.3	26.6	8.1	6.9			11.8
7-COC001.61	8/6/2008	S	0.3	29.3	8.2	5.1			14
7-COC001.61	10/9/2008	S	0.3	20.7	8	7.1			17.4
7-COC001.61	12/17/2008	S	0.3	7.3	8.1	11.4			18.8
7-COC001.61	1/8/2009	S	0.3	5.8	7.9	10.7			18.2
7-COC001.61	3/19/2009	S	0.3	9.1	8	11.1			16.5
7-COC001.61	5/14/2009	S	0.3	20.5	8.4	8.7			12.7
7-COC001.61	7/16/2009	S	0.3	27.7	8.5	8.5			14.9
7-COC001.61	9/10/2009	S	0.3	23.4	7.4	5.1			15.5
7-COC001.61	11/23/2009	S	0.3	13.2	7.7	9.1			15.3
7-COC001.61	2/22/2010	S	0.3	6.2	7.5	12.5			11.6
7-COC001.61	4/5/2010	S	0.3	17.1	8.2	11			10.6
7-COC001.61	6/3/2010	S	0.3	28.3	8.1	11.2			11.9
7-COC001.61	8/31/2010	S	0.3	29.2	7.9	6.8			15.8
7-COC001.61	10/12/2010	S	0.3	20.7	7.7	8.3			18.1
7-COC001.61	12/14/2010	S	0.3	3.3	7.5	11.9			18.7
7-COC001.61	2/10/2011	S	0.3	3.7	7.7	12.4			16
7-COC001.61	4/11/2011	S	0.3	14.3	8.4	10.9			11.3
7-COC001.61	6/27/2011	S	0.3	27.5	8.2	6.6			10.5

ATTACHMENT E

1976 VIMS Model for Cockrell Creek

4010 WEST F ST

State Water Control Board

P. O. Box 11143

RICHMOND, VA.

RM
Omnikey Fact Sheet

SUBJECT: Menhaden Industries Permit Reissuance - Cockrell Creek Wasteload Allocation - Northumberland County

TO: File - Kilmarnock Office

FROM: G. T. Yagel

DATE: August 15, 1979

COPIES: L. S. McBride, L. G. Lawson, A. J. Anthony, J. R. Bell, F. K. Cunningham
Dale F. Jones, Burton R. Tuxford

In anticipation of this division's responsibilities for the reissuance of permits for two menhaden industries in Northumberland County, the issue of wasteload allocation for CBOD₅ has been under consideration for more than a year. The deadline date for the reissuance is January 1980. No attempt will be made to include in this memorandum a summary of all of the items brought forth in many conferences with VIMS, the permittee consultants, and other staff members. That information can be found in our regional office file. The purpose of this memorandum is to set forth conclusions reached during a conference with personnel of BAT, BWCM, BE, and TRO-DSP on August 7, 1979 at 10:30 a.m. Personnel involved are listed below:

A. J. Anthony	- BAT
J. R. Bell	- BAT
Dale F. Jones	- BWCM
Burton R. Tuxford	- BWCM
Anne Field	- BE
G. T. Yagel	- TRO-DSP

1. VIMS model of Cockrell Creek has been verified and will be utilized as the basis for wasteload allocation of the total loading from these menhaden industries during the drafting of limitations for reissued permits.
2. In accordance with the VIMS model, 5,000 pounds per day of carbonaceous BOD is the total limit allowable for all discharges into Cockrell Creek in order that 5.0 mg/l of DO will be maintained in the upper layer of that receiving stream. 100 pounds per day of that total will be reserved for the Reedville Sanitary District sewage treatment facilities in order that growth may be allowed, leaving the industries with 4,900 pounds per day.)
3. The 4,900 pounds total loading is considered a daily average and not a daily maximum.
4. The upper layer of Cockrell Creek, as identified in the VIMS model will be used to determine wasteload allocation which is agreed to by BWCM.

Omega Fact Sheet

File - Kilmarnock Office
Cockrell Creek Wasteload Allocation
Page 2
August 15, 1979

5. Suspended Solids loading will be reduced in the reissued permits by the same proportion as the CBOD₅.
6. Net loading methodology used in the past for calculating daily loading from each industry will be deleted.
7. Alteration of the water quality standards now applicable to Cockrell Creek can only be accomplished in accordance with Section 35.1550 appearing in the Federal Register/Volume 44 No. 101/Wednesday, May 23, 1979. It was Anne Field's opinion that relaxation of existing standards could be accomplished only if economic data, provided by each industry, demonstrated that compliance with wasteload allocations planned would necessitate termination of the operations of these industries.
8. After considering all alternatives for allocation methodology, it was decided that productivity capability of each industry would be used as the basis for determining the percentage of allowable loading of waste to be allocated to each industry during the drafting of permit limits for permit reissuance. TRO-DSP personnel will confer with the management of each industry on August 20, 1979 for the purpose of explaining the allocation methodology agreed upon in securing production capacity data.
9. In response to F. K. Cunningham and G. T. Yagel's memorandum to Dale Jones, dated August 6, 1979, comments from Dale Phillips regarding the approach planned for wasteload allocation and the use of the VIMS model are expected prior to August 20, 1979.

The writer is anticipating that at least one of these industries may be requesting a hearing before the Board after they receive notice of the allocation offered them, for the purpose of contesting our decision in accordance with the provisions of Regulation #6 and the current NPDES Permit Issuance Manual. During that hearing, economic data may be provided by each or both of these industries. That data probably should include dollar value of the final product exported from each of these plants to their markets, other socio-economic factors, which only the industries can provide, number of employees affected by possible termination of production, and production data for the 1973-1974 seasons as compared to that data available for the 1977-1978 production seasons.

/bj

HYDROGRAPHY AND HYDRODYNAMICS
OF VIRGINIA ESTUARIES

IX. Mathematical Water Quality Study of Great
Wicomico River and Cockrell Creek

by

P. V. Hyer
J. Jacobson

PREPARED UNDER

THE COOPERATIVE STATE AGENCIES PROGRAM

OF

THE VIRGINIA STATE WATER CONTROL BOARD AND
THE VIRGINIA INSTITUTE OF MARINE SCIENCE

Project Officers

Dale Jones
Michael Bellanca

Virginia State Water Control Board

Special Report No. 120
in Applied Marine Science and
Ocean Engineering

Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

William J. Hargis, Jr.
Director

September 1976

III. Description of Study Area

The drainage area of the Great Wicomico River takes in a portion of Northumberland County (see figure 1). This region is rural, with about half the land area covered by forest. Farming, commercial fishing and fish processing are the financial mainstays for the area.

Mean daily minimum temperatures are approximately thirty degrees and sixty-nine degrees Fahrenheit (minus one and twenty-one degrees Celsius) for January and July, respectively. The corresponding mean daily maximum temperatures are forty-eight degrees and eighty-eight degrees Fahrenheit respectively (nine and thirty-one degrees Celsius). Precipitation in the drainage basin exceeds forty-six inches (117 cm) per year. Autumn is drier than the rest of the year. Precipitation in the summer tends to occur as brief, heavy thundershowers, rather than as the more prolonged storms that occur throughout the rest of the year.

The Great Wicomico River empties directly into Chesapeake Bay. The land area of the drainage basin is only 70.6 square miles (182.8 km^2), resulting in relatively little freshwater inflow to the river. Tidal action is also weak, with the tidal current amplitude being on the order of 0.5 ft/sec (15 cm/sec) or less. Since the stream is short, there is very little time lag in the upstream propagation of the tidal wave.

Cockrell Creek is a tributary to the Great Wicomico. The creek empties into the river close to the river mouth. The creek has characteristics similar to the river; small drainage area (4.6 square miles, or 11.9 km^2) weak tidal action and low freshwater input. Two fish processing plants as well as the town of Reedville are located on Cockrell Creek. During the summer, the two plants introduce a total of about 5000 lb/day (2300 kg/day) of five-day carbonaceous BOD and about 900 lb/day (410 kg/day) of organic nitrogen and ammonia (as N).

ATTACHMENT F

Site Inspection Report



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY PIEDMONT REGIONAL OFFICE

Molly Joseph Ward
Secretary of Natural Resources

4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

David K. Paylor
Director

Michael P. Murphy
Regional Director

September 29, 2015

Bill Purcell
Environmental Manager
Omega Protein, Inc.
610 Menhaden Road
Reedville, VA 22539

RE: VPDES Permit No. VA0003867
Omega Protein, Inc. FY15 Inspection Report

Dear Mr. Purcell:

Enclosed is your copy of the report for the inspection conducted at the above referenced facility on August 27, 2015. Please review the comments and general recommendations on page five of the technical inspection report and the pH analysis comments on page 3 of the lab inspection report. The comments and general recommendations referenced herein are reminders, requests, or suggestions which do not require a written response.

I would like to thank you for the time and courtesy extended to me during the inspection. Should you have any questions about the report, please do not hesitate to contact me at 804-527-5129 or via email at Bradford.ricks@deq.virginia.gov.

Sincerely,

A handwritten signature in blue ink, appearing to read "Brad Ricks".

Brad Ricks
Multimedia Compliance Inspector

This letter is not intended as a case decision under the Virginia Administrative Process Act, Va. Code § 2.2-4000 *et seq.* (APA).

Virginia Department of Environmental Quality

WASTEWATER FACILITY INSPECTION REPORT

FACILITY NAME: <u>Omega Protein, Inc.</u>	INSPECTION DATE: <u>8/27/15</u> INSPECTOR <u>Brad Ricks</u> 
PERMIT No.: <u>VA0003867</u>	REPORT DATE: <u>9/16/2015</u>
TYPE OF FACILITY: <input type="checkbox"/> Municipal <input checked="" type="checkbox"/> Small Minor <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Federal	TIME OF INSPECTION: <u>10:00</u> Arrival <u>16:00</u> Departure
PHOTOGRAPHS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	TOTAL TIME SPENT <u>20 hours</u>
REVIEWED BY / Date: <u>Heather A.H. Deihls</u> ; <u>9/25/15</u>	UNANNOUNCED INSPECTION? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PRESENT DURING INSPECTION: Laura Galli (DEQ), Bill Purcell (Omega), Burton Thrift (Omega)	

TECHNICAL INSPECTION

1. Has there been any new construction? • If so, were plans and specifications approved?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Comments: _____	
2. Is the Operations and Maintenance Manual approved and up-to-date?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Comments: See Notes and Comments section below.	
3. Are the Permit and/or Operation and Maintenance Manual specified licensed operator being met?	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
Comments: Class III required only for lagoon treatment which is not in operation.	
4. Are the Permit and/or Operation and Maintenance Manual specified operator staffing requirements being met?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Comments: Mr. Thrift on daily operations with Mr. Purcell as backup.	
5. Is there an established and adequate program for training personnel?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Comments: Air stripper equipment training conducted for 10 employees on 3/30/15.	
6. Are preventive maintenance task schedules being met?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Comments: Documented in daily logs.	
7. Does the plant experience any organic or hydraulic overloading?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Comments: None reported since last inspection.	
8. Has there been any bypassing or overflows since the last inspection?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Comments: None reported since last inspection.	
9. Is the standby generator (including power transfer switch) operational and exercised regularly?	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
Comments: Not required and not applicable. In the event of a power outage, process water is not generated.	
10. Is the plant alarm system operational and tested regularly?	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
Comments: Not required and not applicable.	

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0003867
----------	-----------

TECHNICAL INSPECTION

<p>11. Is sludge disposed of in accordance with the approved sludge management plan? <u>Comments:</u> Not applicable as waste sludge is not generated.</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
<p>12. Is septage received?</p> <ul style="list-style-type: none"> • If so, is septage loading controlled, and are appropriate records maintained? <p><u>Comments:</u> Not received.</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
<p>13. Are all plant records (operational logs, equipment maintenance, industrial waste contributors, sampling and testing) available for review and are records adequate?</p> <p><u>Comments:</u> Operational logs reviewed and adequate.</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<p>14. Which of the following records does the plant maintain?</p> <p><input checked="" type="checkbox"/> Operational logs <input checked="" type="checkbox"/> Instrument maintenance & calibration</p> <p><input checked="" type="checkbox"/> Mechanical equipment maintenance <input type="checkbox"/> Industrial Waste Contribution (Municipal facilities)</p> <p><u>Comments:</u> No external industrial contributors.</p>	
<p>15. What does the operational log contain?</p> <p><input checked="" type="checkbox"/> Visual observations <input checked="" type="checkbox"/> Flow Measurement <input type="checkbox"/> Laboratory results <input checked="" type="checkbox"/> Process adjustments</p> <p><input type="checkbox"/> Control calculations <input checked="" type="checkbox"/> Other (specify) <input type="checkbox"/> Field parameters - pH and Dissolved Oxygen</p> <p><u>Comments:</u></p>	
<p>16. What do the mechanical equipment records contain?</p> <p><input type="checkbox"/> As built plans and specs <input type="checkbox"/> Manufacturers instructions <input type="checkbox"/> Lubrication schedules</p> <p><input type="checkbox"/> Spare parts inventory <input type="checkbox"/> Equipment/parts suppliers</p> <p><input type="checkbox"/> Other (specify) <input type="checkbox"/></p> <p><u>Comments:</u> Not Reviewed</p>	
<p>17. What do the industrial waste contribution records contain (Municipal only)?</p> <p><input type="checkbox"/> Waste characteristics <input type="checkbox"/> Impact on plant <input type="checkbox"/> Locations and discharge types</p> <p><input type="checkbox"/> Other (specify) <input type="checkbox"/></p> <p><u>Comments:</u> Not Applicable</p>	
<p>18. Which of the following records are kept at the plant and available to personnel?</p> <p><input checked="" type="checkbox"/> Equipment maintenance records <input checked="" type="checkbox"/> Operational log <input type="checkbox"/> Industrial contributor records</p> <p><input checked="" type="checkbox"/> Instrumentation records <input checked="" type="checkbox"/> Sampling and testing records</p> <p><u>Comments:</u></p>	
<p>19. List records not normally available to plant personnel and their location: <u>Comments:</u> All records are available on site.</p>	
<p>20. Are the records maintained for the required time period (three or five years)? <u>Comments:</u></p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0003867
----------	-----------

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

Evaporative condensate is treated by ammonia stripping with pH adjustment prior to discharge. All treatment equipment appeared to be in good working order.

Wastewater lagoons are no longer in use and facility personnel stated the lagoon outfall is sealed to prevent discharge. Though lagoons retain water in them, freeboard is sufficient to prevent a surface discharge and lagoon groundwater is monitored in accordance with the Groundwater Monitoring Plan. DEQ has not received notice of intended lagoon closure and/or a lagoon closure plan. If the lagoon will be permanently closed, a lagoon closure plan should be submitted for review and approval in accordance with permit condition I.B.9. The DAF and UV treatment systems have been disconnected and are not currently in use.

Discharge flow is measured by a totalizing flow meter and recorded daily in the log book.

VA DEQ Wastewater Facility Inspection Report

Permit #

VA0003867

EFFLUENT FIELD DATA:

Flow	<input type="text"/> MGD	Dissolved Oxygen	<input type="text"/> mg/L	TRC (Contact Tank)	<input type="text"/> mg/L
pH	<input type="text"/> S.U.	Temperature	<input type="text"/> °C	TRC (Final Effluent)	<input type="text"/> mg/L

Was a Sampling Inspection conducted? Yes (see Sampling Inspection Report) No

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS – Outfall 002:

1. Type of outfall: Shore based Submerged Diffuser? Yes No
2. Are the outfall and supporting structures in good condition? Yes No
3. Final Effluent (evidence of following problems):

<input type="checkbox"/> Turbid effluent	<input type="checkbox"/> Visible foam	<input type="checkbox"/> Sludge bar	<input type="checkbox"/> Grease
		<input type="checkbox"/> Unusual color	<input type="checkbox"/> Oil sheen
4. Is there a visible effluent plume in the receiving stream? Yes No
5. Receiving stream: No observed problems Indication of problems (explain below)
Comments:

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS – Outfall 995:

6. Type of outfall: Shore based Submerged Diffuser? Yes No
7. Are the outfall and supporting structures in good condition? Yes No
8. Final Effluent (evidence of following problems):

<input type="checkbox"/> Turbid effluent	<input type="checkbox"/> Visible foam	<input type="checkbox"/> Sludge bar	<input type="checkbox"/> Grease
		<input type="checkbox"/> Unusual color	<input type="checkbox"/> Oil sheen
9. Is there a visible effluent plume in the receiving stream? Yes No
10. Receiving stream: No observed problems Indication of problems (explain below)
Comments:

REQUEST for ACTION:

None

VA DEQ Wastewater Facility Inspection Report

Permit #

VA0003867

NOTES and COMMENTS:

Permit Special Condition comments:

Part I.A.1.b: It is noted that Outfall 002 is a subsurface diffuser; therefore, it is not possible to obtain samples directly from the outfall location. Samples are collected roughly 100 yards upstream of this outfall and are entirely representative of the final effluent.

Part I.B.5: The permit requires a revised Operation and Maintenance (O&M) Manual to be submitted for approval within 90 days of the 4/27/2015 permit modification. Review of DEQ records indicates that this manual was not received by the time of inspection. Mr. Purcell provided email records which demonstrate that the manual was sent electronically on May 8, 2015; however, due to the large file size, the message was not received by DEQ. Mr. Purcell stated that Omega did not receive email notification that the message was not delivered to its intended recipients. DEQ-PRO received the manual by mail on 9/15/2015. Completeness review is being conducted separately from this inspection.

Photographs:

1. Outfall 995



2. Outfall 002

VA DEQ Wastewater Facility Inspection Report



DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
LABORATORY INSPECTION REPORT

11/2014

PERMIT #: VA0003867 VAN020037	INSPECTION DATE: 8/27/2015	PREVIOUS INSP. DATE: 11/5/2009	PREVIOUS EVALUATION: Deficiencies	TIME SPENT: 20 hours w/ travel & report
NAME/ADDRESS OF FACILITY: Omega Protein, Inc. PO Box 175 Reedville, VA 22539		FACILITY CLASS: <input type="checkbox"/> MAJOR <input checked="" type="checkbox"/> MINOR <input type="checkbox"/> MINOR (Small) <input type="checkbox"/> VPA	FACILITY TYPE: <input type="checkbox"/> MUNICIPAL <input checked="" type="checkbox"/> INDUSTRIAL <input type="checkbox"/> FEDERAL	UNANNOUNCED INSPECTION? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
				FFY-SCHEDULED INSPECTION? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
INSPECTOR(S): Brad Ricks 		REVIEWER(S): Heather A.H. Deihls 9/25/15	PRESENT AT INSPECTION: Laura Galli (DEQ), Bill Purcell (Omega), Burton Thrift (Omega)	
LABORATORY EVALUATION				DEFICIENCIES?
				<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
LABORATORY RECORDS				<input checked="" type="checkbox"/>
GENERAL SAMPLING AND ANALYSIS				<input checked="" type="checkbox"/>
pH PROCEDURE				<input checked="" type="checkbox"/>
TEMPERATURE PROCEDURES				<input type="checkbox"/>
OTHER				<input type="checkbox"/>
				<input type="checkbox"/>

VELAP CERTIFICATION (on site Environmental Laboratory)		Yes	No
Does the laboratory have VELAP certification (interim or final)?			X
– Document the laboratory's VELAP laboratory number:			
– Document the effective date of the VELAP certification:			
– Document the expiration date of the VELAP certification:			
– List the certified parameters:			
VELAP ACCREDITATION (Commercial Environmental Laboratory)		Yes	No
IS A VELAP ACCREDITED LAB USED FOR OTHER PERMIT REQUIRED ANALYSES? VELAP#, LAB NAME, ADDRESS and LIST PARAMETERS:		<input checked="" type="checkbox"/> Yes	
VELAP # 460036 460187	LAB NAME Universal Laboratories – Hampton, VA Microbac Laboratories – Marietta, OH		
IF PERMIT REQUIRED SAMPLE ANALYSIS IS PERFORMED AT ANOTHER LOCATION, ARE SHIPPING PROCEDURES ADEQUATE?		<input checked="" type="checkbox"/> Yes	

COPIES: () DEQ - RO; (X) Owner, () Other:

PERMIT #:
VA0003867, VAN020037

LABORATORY RECORDS SECTION

LABORATORY RECORDS INCLUDE THE FOLLOWING:

<input checked="" type="checkbox"/>	SAMPLING DATE	<input checked="" type="checkbox"/>	ANALYSIS DATE	<input type="checkbox"/>	CONT MONITORING CHART
<input checked="" type="checkbox"/>	SAMPLING TIME	<input checked="" type="checkbox"/>	ANALYSIS TIME	<input type="checkbox"/>	INSTRUMENT CALIBRATION
<input checked="" type="checkbox"/>	SAMPLE LOCATION	<input checked="" type="checkbox"/>	TEST METHOD	<input type="checkbox"/>	INSTRUMENT MAINTENANCE
				<input checked="" type="checkbox"/>	CERTIFICATE OF ANALYSIS

WRITTEN INSTRUCTIONS INCLUDE THE FOLLOWING:

<input type="checkbox"/>	SAMPLING SCHEDULES	<input type="checkbox"/>	CALCULATIONS	<input checked="" type="checkbox"/>	ANALYSIS PROCEDURES
--------------------------	--------------------	--------------------------	--------------	-------------------------------------	---------------------

	YES	NO	N/A
DO ALL ANALYSTS INITIAL THEIR WORK?	X		
DO BENCH SHEETS (or LOG BOOK) INCLUDE ALL INFORMATION NECESSARY TO DETERMINE RESULTS?	X		
IS THE DMR COMPLETE AND CORRECT? LIST MONTH(S) REVIEWED: June 2015 <i>reviewed</i>	X		
ARE ALL MONITORING VALUES REQUIRED BY THE PERMIT REPORTED?	X		
DOES CHAIN OF CUSTODY DOCUMENT PROPER SAMPLE PRESERVATION WAS MET?	X		
WHEN THE CERTIFICATE OF ANALYSIS CONTAINS FLAGGED DATA IS THE 'FLAG' REPORTED ON THE DMR?			X

GENERAL SAMPLING AND ANALYSIS SECTION

	YES	NO	N/A
ARE SAMPLE LOCATIONS ACCORDING TO PERMIT REQUIREMENTS?	X		
ARE PERMIT REQUIRED SAMPLE COLLECTION PROCEDURES APPROPRIATE?	X		
ARE EFFLUENT SAMPLES REPRESENTATIVE OF THE MONITORED ACTIVITY?	X		
ARE PERMIT REQUIRED COMPOSITE SAMPLES FLOW PROPORTIONAL? NOTE: Equal volume composite aliquots are acceptable <i>if the instantaneous flow is within ± 10% of the daily average flow during the monitoring period.</i> Some permits specify how the composite is to be taken (e.g., 5G/8HC).	X		
IS COLLECTION SAMPLE EQUIPMENT ADEQUATE?	X		
IS FLOW MEASUREMENT ACCORDING TO PERMIT REQUIREMENTS?	X		

DEPARTMENT OF ENVIRONMENTAL QUALITY – WATER DIVISION
LABORATORY INSPECTION REPORT SUMMARY

FACILITY NAME:	Omega Protein Inc.		Permit #:	VA0003867 VAN020037	INSPECTION DATE:	8/27/2015															
LABORATORY EVALUATION			No required actions at this time																		
		X	REQUIRED CORRECTIVE ACTION(s) IDENTIFIED																		
SUMMARY of REQUEST FOR CORRECTIVE ACTION																					
Lab Records																					
Laboratory Records section deficiency and required action:																					
1. None																					
General Sampling and Analysis																					
General Sampling and Analysis section deficiency and required action:																					
1. None																					
pH Analysis																					
pH deficiency and required action:																					
<ol style="list-style-type: none"> 1. pH analysis is conducted on site by the site Environmental Regulatory Coordinator, Burton Thrift. Mr. Thrift stated that does not possess a certificate of operator competence or initial demonstration of capability to perform pH analysis. The associated form and instructions are attached in addition to current method analysis instructions. Please complete the initial demonstration of capability form and maintain in site files. 2. Sample and analysis times were not recorded in the reviewed logbook. Please be sure these are recorded, so holding times can be verified. 3. In May 2012, EPA issued a final rule to approve several new or revised analytical methods for measuring regulated pollutants in wastewater. This rule is also called the Methods Update Rule (MUR). One of the changes in this MUR is the naming convention used for citing Standard Methods. Citing the edition of Standard Methods is no longer applicable; now the citation must include the “date tag” in which the method was approved. Also note that the 18th and 19th Editions of Standard Methods are no longer approved; only the 20th, 21st, 22nd, and online editions are approved. For field parameters, only the 21st, 22nd and online Editions are approved. The current field parameter method citations are: 																					
<table border="1"> <thead> <tr> <th>Parameter</th> <th>SM 21 ed.</th> <th>SM 22nd ed. or Online ed.</th> </tr> </thead> <tbody> <tr> <td>Dissolved Oxygen</td> <td>SM4500-O G -2001</td> <td>SM4500-O G -2011</td> </tr> <tr> <td>pH</td> <td>SM4500-H⁺ -2000</td> <td>SM4500-H⁺ -2011</td> </tr> <tr> <td>Total residual chlorine</td> <td>SM4500-Cl G -2000</td> <td>SM4500-Cl G -2011</td> </tr> <tr> <td>Temperature</td> <td>SM2550 B-2000</td> <td>SM2550 B-2010</td> </tr> </tbody> </table>							Parameter	SM 21 ed.	SM 22 nd ed. or Online ed.	Dissolved Oxygen	SM4500-O G -2001	SM4500-O G -2011	pH	SM4500-H ⁺ -2000	SM4500-H ⁺ -2011	Total residual chlorine	SM4500-Cl G -2000	SM4500-Cl G -2011	Temperature	SM2550 B-2000	SM2550 B-2010
Parameter	SM 21 ed.	SM 22 nd ed. or Online ed.																			
Dissolved Oxygen	SM4500-O G -2001	SM4500-O G -2011																			
pH	SM4500-H ⁺ -2000	SM4500-H ⁺ -2011																			
Total residual chlorine	SM4500-Cl G -2000	SM4500-Cl G -2011																			
Temperature	SM2550 B-2000	SM2550 B-2010																			
<p><i>Please ensure laboratory records and benchesheets are updated to reflect the above change in citing test methods.</i></p>																					
Temperature Analysis																					
Temperature deficiency and required action: None																					
OTHER – Comments or Observations																					

The permit specifies that Outfall 002 samples are to be "taken at Outfall 002". Because this is a submerged and diffused outfall, sample collection at the outfall is not possible. The sample collection location provides samples representative of Outfall 002.

ANALYST:	This form was completed based on record review of the June 2015 logbook sample provided following the inspection.	VPDES NO	VA0003867
----------	--	----------	------------------

Meter: _____

Parameter: Hydrogen Ion (pH)

Method: Electrometric

3/2015

METHOD OF ANALYSIS:

<input type="checkbox"/>	21 st Edition of Standard Methods (SM 21) – 4500-H ⁺ B-2000 (SM 21 pH)
* <input checked="" type="checkbox"/>	22 nd Edition of Standard Methods (SM 22), or Online Editions of Standard Methods – 4500-H ⁺ B-2011 (SM 22 pH)

pH is a method-defined analyte so modifications are not allowed. [40 CFR Part 136.6]

- | | |
|----------|----------|
| Y | N |
|----------|----------|
- 1) Is a certificate of operator competence or initial demonstration of capability available for each analyst/operator performing this analysis? **NOTE:** Analyze 4 samples of known pH; you may use an external source of buffers or other known standards (different lot/manufacturer than buffers used to calibrate meter). Recovery for each of the 4 samples must be +/- 0.2 SU of the known concentration of the sample or within “Acceptable Range” specified by the PT provider. [SM 1020 B.1] **NOTE: The same pH buffer [values] used for calibration of the instrument can be used as LCS if from a different source or different lot.**
- 2) **IF** a replicate sample is analyzed is there a written procedure for which result will be reported on DMR (Sample or Replicate) and is this procedure being followed? [DEQ – based on EPA Good Laboratory Practices Standards]
- 3) Is a Laboratory Control Sample (LCS) tested at least annually and are results within acceptance criteria? [SM 21 B.2 or SM 22 1020 B.3.] **NOTE:** LCS should be a purchased Proficiency Test (PT) sample or a different buffer other than ones used for calibration of the meter [with a +/- 0.2 SU acceptance range or within “Acceptable Range” specified by the PT provider]. **NOTE: The same pH buffer [values] used for calibration of the instrument can be used as LCS if from a different source or different lot.**
- 4) Is the electrode in good condition (no chloride precipitate, scratches, deterioration, etc.)? [SM 21 pH or SM 22 pH 2.b./c. and 5.b.]
- 5) Is electrode storage solution in accordance with manufacturer's instructions? [SM 21 pH or SM 22 pH 4.a. and Mfr.]
- 6) Is meter calibrated on at least a daily basis using three buffers all of which are at the same temperature? [SM 21 pH or SM 22 pH 4.a.] **NOTE:** Start with Buffer 7 unless manufacturer's instructions state otherwise. **[NOTE:** If meter is not capable of 3 buffer calibration use 2 buffers bracketing the expected sample pH and then measure a 3rd buffer (the measurement value recorded must be +/- 0.1 SU), and then reread and record value of buffer 7 to ensure +/- 0.1 SU.]
- 7) After calibration, is a buffer analyzed as a check sample to verify that calibration is correct? Verification measurement should be within +/- 0.1 SU. [SM 21 1020 B 10.c. or SM 22 1020 B 11.c.]
- 8) Is calibration verification measurement repeated with every 10 samples and at the end of a series of samples? Verification measurement should be within +/- 0.1 SU. [SM 21 pH or SM 22 pH 4020 B 2.b.] **NOTE:** Not applicable if pH meter is calibrated before taking any measurement (e.g., if operator monitors daily pH at more than one facility and calibrates before each measurement).
- 9) Do the buffer solutions appear to be free of contamination or growths? [SM 21 pH or SM 22 pH 3.a.]
- 10) Are buffer solutions within the listed shelf-life or have they been prepared within the last 4 weeks? [SM 21 pH or SM 22 pH 3.a.]

ANALYST:	This form was completed based on record review of the June 2015 logbook sample provided following the inspection.	VPDES NO	VA0003867
----------	--	----------	-----------

Parameter: Hydrogen Ion (pH)

Method: Electrometric

11)	Is the cap or sleeve covering the access hole on the reference electrode removed when measuring pH? [Mfr.]	*	
12)	Is sample analyzed within 15 minutes of collections? [40 CFR Part 136]		x
13)	Is the electrode rinsed and then blotted dry between reading solutions (Disregard if a portion of the next sample analyzed is used as the rinsing solution.)? [SM 21 pH or SM 22 pH 4.a and 4.b]	*	
14)	Is the sample stirred gently at a constant speed during measurement? [SM 21 pH or SM 22 pH 4.b.]	*	
15)	Does the meter hold a steady reading after reaching equilibrium? [4.b.]	*	

*NOTES/ PROBLEMS: This form was completed based on record review of the June 2015 logbook sample provided following the inspection, therefore not all items are completed. Please be sure the proper edition of Standard Methods is used. See page 3 of this report for further details.

#1-3: Please be sure these QA/QC items are completed. #6: Calibration verification performed with pH buffer 4. #12: Sample collection and analysis times are not differentiated in the logbook.

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
SAMPLE ANALYSIS HOLDING TIME/CONTAINER/PRESERVATION CHECK SHEET

Revised 02/2015 [40 CFR, Part 136.3, Table II]

FACILITY NAME:		Omega Protein Inc.						VPDES NO	VA0003867 VAN020037	DATE:	8/27/2015			
HOLDING TIMES [Note: Collection period (for composites) and Sample Collection time (end of collection period) must be recorded on the COC.]								SAMPLE CONTAINER			PRESERVATION [Note: Preservation is to occur <u>within 15</u> minutes of the end of the collection period.]			
PARAMETER	APPROVED	MET?		LOGGED?		ADEQ. VOLUME		APPROP. TYPE		APPROVED	MET?		CHECKED?	
		Y	N	Y	N	Y	N	Y	N		Y	N		
pH	15 MIN.	X			X	X		X		Within 15 minutes				
CHLORINE	15 MIN.									Within 15 minutes				
DISSOLVED O ₂	15 MIN									Within 15 minutes				
TEMPERATURE	IMMERSION STAB.	X		X		X		X		N/A - Immediately				
BOD ₅ & CBOD ₅	48 HOURS									≤6° C	X		X	
TSS	7 DAYS									≤6° C	X		X	
COD	28 DAYS									≤6° C+H ₂ SO ₄ , HCl, or H ₃ PO ₄ pH<2				
O&G as HEM (Method 1664)	28 DAYS									≤6° C+H ₂ SO ₄ or HCl pH<2	X		X	
TPH - DRO and GRO (SW 846 Methods: 8015, 8260 and 8270)	DRO – NS GRO 14 DAYS									DRO – None GRO - ≤6° C+H ₂ SO ₄ or HCl pH<2				
FECAL COLIFORM / E. coli / Enterococci	8 HRS									<10° C+0.008% Na ₂ S ₂ O ₃				
AMMONIA	28 DAYS									DECHLOR ≤6° C+H ₂ SO ₄ pH<2t	X		X	
TKN	28 DAYS									DECHLOR ≤6° C+H ₂ SO ₄ pH<2	X		X	
NITRATE or NITRITE	48 HOURS									≤6° C	X		X	
NITRATE+NITRITE	28 DAYS									≤6° C+H ₂ SO ₄ pH<2	X		X	
TOTAL PHOS.	28 DAYS									≤6° C+H ₂ SO ₄ pH<2	X		X	
METALS	6 MONTHS									HNO ₃ pH<2 Dissolved Metals: 0.45 µm filter immediately	X		X	
PROBLEMS:	Note: All chemical preservation should be noted by the Permittee on the Chain of Custody. The pH logbook does not indicate sample and analysis times, so the 15 minute holding time can not be verified. Please begin to record and differentiate sample collection and sample analysis times. If measurements are made in situ, this should also be noted.													

Holding Times and Preservation References (VELAP except for Field Tests)

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
EQUIPMENT TEMPERATURE LOG/THERMOMETER VERIFICATION CHECK SHEET

11/2014

FACILITY NAME:	Omega Protein, Inc.				PERMIT NO:	VA0003867 VAN020037	DATE:	8/27/2015				
EQUIPMENT	Preservation Range	In Range?		Inspector Reading °C	Checked & Logged Daily?		Correct Increment?		ANNUAL THERMOMETER VERIFICATION			
		Yes	No		Yes	No	Yes	No	DATE CHECKED	MARKED	OFFSET VALUE1 (Correction) °C	INSPECT TEMP °C
SAMPLE REFRIGERATOR	1-6° C											
AUTO SAMPLER	1-6° C				X							
pH METER	± 1° C										-0.8 °C	
D.O. METER	± 1° C											
THERMOMETER-(EFFLUENT)	± 1° C											

PROBLEMS:

Note: Auto sampler, thermometer and pH meters not inspected. Samples are packaged for delivery on date of collection; therefore refrigeration inspection not required. Log book records indicate sampler temperature is checked on date of sample collection.

1 Offset Value tolerances (reference NIST 105-6): Sampling Refrigerator and Auto Sampler, pH and D.O. meters must be within ±2°C (2 times tolerance value). Thermometers measuring Outfall permit compliance must be within ±1.0°C (2 times tolerance value).

ATTACHMENT G

1998 Dilution Ratios Model – Outfall 002

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY Piedmont Water Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296

804/527-5020

SUBJECT: Cockrell's Creek Wasteload Allocations and Dilution Analysis
Zapata Protein (USA), Inc. Discharge (VA0003867)

TO: Denise Mosca

FROM: Jon van'Soestbergen *[Signature]*

DATE: September 17, 1998

COPIES: Dale Phillips, Curt Linderman

Per your request, I have reviewed the BOD wasteload allocations for the subject discharge to Cockrell's Creek. I also constructed a CORMIX model to analyze dilution ratios at the discharge associated with different diffuser designs. Two discharges (Ampro Fisheries and Zapata Protein) previously competed for the available assimilative capacity of the receiving stream, and previous models and analyses simulated both discharges to allocate wasteloads. However, the Ampro discharge was terminated. The purpose of this review was to determine if the BOD wasteload previously allocated to Ampro was available in part, or in total, to Zapata. The CORMIX analysis of a diffuser for outfall number 002 was performed to determine the dilution ratio for establishing wasteload allocations for conservative parameters.

BOD Wasteload Allocation Review

In September 1976, the Virginia Institute of Marine Sciences (VIMS) completed a mathematical water quality study of the Great Wicomico River and Cockrell's Creek. The model determined that an average of 5,000 lbs/day of BOD₅ would maintain water quality standards in the upper layer of the creek, which was the only layer used to determine the pollutant loading to the creek. Of this total, 4,900 lbs/day would be allocated to Ampro (then known as Standard Products) and Zapata.

My review of the available information leads me to conclude that the total allowable loading to Cockrell's Creek is 5,000 lbs/day of BOD₅, regardless of the point of discharge. Therefore, with the termination of the Ampro discharge, the entire 4,900 lbs/day previously allocated to the two discharges is available for allocation to Zapata.

CORMIX Diffuser Analysis

Zapata currently proposes to discharge through a total of four outfalls to Cockrell's Creek, but only outfall 002 was considered for a diffuser. The proposed discharge flow from this outfall is 0.300 mgd. The complex design of the diffuser included with the permit fact sheet can not be accurately analyzed using the CORMIX model. However, by simplifying the design somewhat, the expected dilution the diffuser will provide could be estimated. In addition to analyzing the design of this diffuser, a modified design was analyzed which affords better dilution in the near field.

Two diffuser designs were analyzed; one which closely approximates the design included in the fact sheet ("short diffuser") and one which affords better dilution ("long diffuser"). For each case, dilution was analyzed relative to one-hour averages under critical conditions, which most closely approximates the way the acute standards are written.

Cockrell's Creek Wasteload Allocations and Dilution Analysis
Page 2

"Short Diffuser" - This diffuser design consists of a 12-inch diameter pipe extending 35 feet perpendicular to the east bank of the creek into water of approximately 5 foot depth. The diffuser line (the part with holes) starts 15 feet from the shore and extends to the end of the diffuser (20 feet). There are 13 holes of 4 inch diameter in the top of the pipe, and the end is blocked such that all flow is directed upward through the diffuser ports (holes). A rough sketch of the diffuser is attached.

This "short diffuser" design results in a dilution of 50:1 at the boundary of the mixing zone. This dilution ratio should be used to determine both acute and chronic WLAs for the discharge. The associated mixing zone boundary is 7.62 meters (25 feet) measured in a circle from the diffuser midpoint.

"Long Diffuser" - This diffuser consists of a 12-inch diameter pipe extending 60 feet perpendicular to the east bank of the creek, also into water of approximately 5 foot depth. The diffuser line starts 20 feet from shore and extends to the end of the diffuser (40 feet). There are 8 holes of 4 inch diameter, located such that flow will be directed in a 45 degree angle toward the water surface in the downstream direction during ebb tide. Again, the end of the pipe is closed so that all flow discharges through the diffuser ports. A rough sketch of the diffuser is attached.

This "long diffuser" design results in a dilution of 100:1 at the boundary of the mixing zone. This dilution should be used for both the acute and chronic WLAs for the discharge. The associated mixing zone boundary is 6.10 meters (20 feet) measured in a circle from the diffuser midpoint.

Conclusions and Recommendation

The BOD₅ wasteload available to Zapata Protein is 4,900 lbs/day.

If the "short diffuser" is specified, a dilution ratio of 50:1 should be used. For the "long diffuser", the dilution ratio can be increased to 100:1. This shows that different diffuser designs can result in dramatically different dilution ratios, and thus need to be taken into consideration when establishing wasteload allocations and permit limits. As such, it is important that the diffuser design be specified for a wasteload allocation based on a given dilution ratio. It is recommended that the alternate diffuser designs be presented to the permittee so that the advantages of each design can be considered. The designs presented should serve only as preliminary designs. The sketches provided herewith should in no way be construed as final diffuser designs. Alternate designs not yet considered are also possible, and can be submitted by the permittee for subsequent analysis using CORMIX.

Pertinent documentation for the CORMIX analysis is included herewith. Should you have any questions or need additional information, please do not hesitate to contact me.

Attachment:

Notes and Model Runs - Zapata Cormix Diffuser Analysis - Cockrell's Creek, 09/16/1998, 24 pages

Attachment q
1/24

ZAPATA CORMX DIFFUSER ANALYSIS - COCKRELL'S CREEK

9-16-98

VA DEQ - PWD J. VAN SOESTBERGEN

MODEL RUN SUMMARIES

6 SEPARATE SCENARIOS WERE RUN TO OBTAIN AVERAGE DILUTION RATIOS RELATIVE TO THE ACUTE STANDARD FOR TWO DIFFERENT DIFFUSER DESIGNS. THREE SCENARIOS WERE NECESSARY FOR EACH DESIGN; AFTER-SLACK (FLOW UP THE CREEK), SLACK (NO AMBIENT FLOW), AND BEFORE-SLACK (FLOW DOWN THE CREEK).

TWO DIFFUSER DESIGNS WERE SIMULATED; SHORT DIFFUSER AND LONG DIFFUSER. SHORT DIFFUSER MOST CLOSELY REPRESENTS THE PROPOSED DIFFUSER DESIGN SUBMITTED BY THE PERMITTEE. LONG DIFFUSER IS A PRO-DESIGNED ALTERNATIVE THAT RESULTS IN BETTER DILUTION IN THE NEAR-FIELD UNDER EBB OR FLOW-TIDE CONDITIONS.

THE FILES ARE AS FOLLOWS

ZAPATA 1 : AFTER-SLACK ; SHORT DIFFUSER

ZAPATA 2 : SLACK TIDE

ZAPATA 3 : BEFORE-SLACK

ZAPATA 4 : AFTER-SLACK ; LONG DIFFUSER

ZAPATA 5 : SLACK TIDE

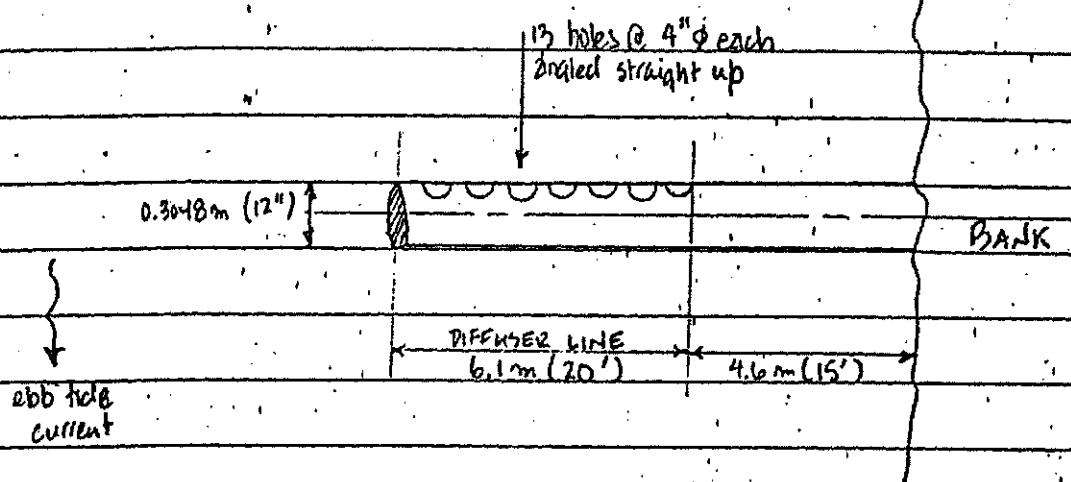
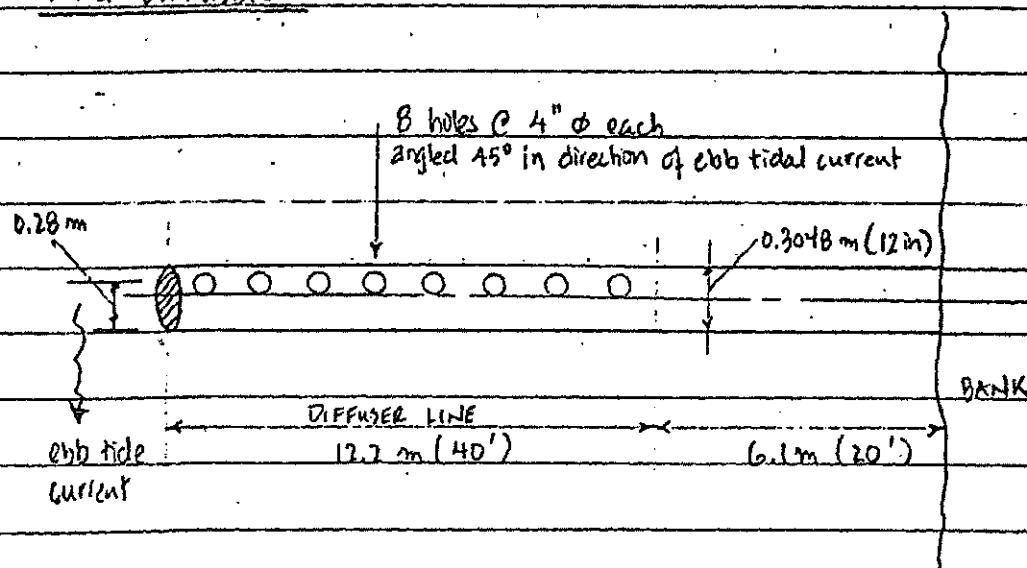
ZAPATA 6 : BEFORE SLACK

ALL SCENARIOS WERE RUN USING CORMX2; I.E. A MULTIPORT SUBMERGED DIFFUSER.

DESIGN SKETCHES OF THE TWO DIFFUSERS ARE ATTACHED.

ZAPATA CORNIX DIFFUSER ANALYSIS - COCKRELL'S CREEK

9.16.98

SHORT DIFFUSER:LONG DIFFUSER:

ZAPATA CORNUX DIFFUSER ANALYSIS

9-16-98

AMBIENT DATA

CHANNEL TYPE :	BOUNDED
WIDTH OF CHANNEL:	503 m
CHANNEL APPEARANCE:	FAIRLY STRAIGHT & UNIFORM
AVERAGE DEPTH:	1.524 m
ACTUAL DEPTH @ DISCH:	1.524 m
AMBIENT FLOW FIELD:	TIDAL REVERSING
PERIOD OF REVERSAL:	12.4 HR SEMI-DIURNAL
FLOW CONDITION :	① AFTER SLACK ; ② SLACK ; ③ BEFORE SLACK
TIME :	1.0 HR
INSTANTANEOUS AMBIENT VEL:	0.15 m/s
MAXIMUM AMBIENT VELOCITY:	0.30 m/s
MANNING'S "n" :	0.07
DENSITY CONDITIONS:	UNIFORM
FRESH OR NON-FRESH:	NON FRESH
AMBIENT DENSITY:	999.7 kg/m ³
WIND SPEED:	2 m/s

ZAPATA CORALYX DIFFUSER ANALYSIS

9.16.98

DISCHARGE DATA

	SHORT	LONG
LENGTH OF DIFFUSER LINE:	6.1 m	12.2 m
BANK DIRECTION:	LEFT	LEFT
DISTANCE TO FIRST NOZZLE:	4.6 m	6.1 m
DISTANCE TO LAST NOZZLE:	10.7 m	18.3 m
ALIGNMENT ANGLE:	90	90
NUMBER OF OPENINGS:	13	8
SINGLE PORTS:	YES (A)	YES (A)
DIAMETER OF PORTS:	0.1 m	0.1 m
CONTRACTION COEFFICIENT:	1.0	1.0
HEIGHT OF PORT CENTERS:	0.3048 m	0.28 m
UNIDIRECTIONAL OR ALTERNATING:	ALTERNATING (B)	UNIDIRECTIONAL (A)
AVERAGE VERTICAL ANGLE:	—	90 45
RELATIVE ORIENTATION ANGLE:	—	90
SAME DIRECTION OR FANNED OUT:	SAME (A)	SAME (A)
HORIZONTAL ANGLE OF DISCHARGE:	—	0
DIFFUSER FLOW RATE:	0.0131 m/s	0.0131 m/s
FRESHWATER EFFLUENT:	YES	YES
TEMPERATURE:	27.7 °C	27.7 °C
HEATED DISCHARGE:	NO	NO
UNITS:	PPB	PPB
CONCENTRATION:	1000	1000
CONSERVATIVE SUBSTANCE:	YES	YES

ATTACHMENT
5/24

ZAPATA CORMIX DIFFUSER ANALYSIS

9-16-98

MIXING ZONE SPECIFICATION

EFFLUENT TOXIC BY USEPA STANDARDS: NO

AMBIENT WATER QUALITY STANDARDS: NO

RMZ SPECIFICATION: NO

MAX DISTANCE OF REGION OF INTEREST: 6,000 m

NUMBER OF OUTPUT DISPLAY STEPS: 10

ZAPATA COMM N. DIFFUSER ANALYSIS

9-16-98

SUMMARY OF RESULTS

(1) SHORT DIFFUSER

FILE	AMBIENT SLENAUD	R
ZAPATA1	AFTER-SLACK	97.3
ZAPATA2	SLACK	5.8
ZAPATA3	BEFORE-SLACK	105.6

$$\text{CONSERVATIVE AVERAGE} = (97.3 + 5.8)/2 = 51.6 \text{ SAY } 50:1$$

(2) LONG DIFFUSER

ZAPATA4	AFTER-SLACK	197.9
ZAPATA5	SLACK	5.1
ZAPATA6	BEFORE-SLACK	210.9

$$\text{CONSERVATIVE AVERAGE} = (197.9 + 5.1)/2 = 101.5 \text{ SAY } 100:1$$

= .1000E+04 CUNITS= PPB
 X = 0
 D = 0
 MZ = 0
 T = 6000.00 XMAX = 6000.00

Z COORDINATE SYSTEM:

ORIGIN is located at the bottom and the diffuser mid-point:
 7.65 m from the LEFT bank/shore.

X-axis points downstream, Y-axis points to left, Z-axis points upward.
 IP = 10 display intervals per module

IN MOD201: DIFFUSER DISCHARGE MODULE

to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

ofile definitions:

BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory

BH = top-hat half-width, in horizontal plane normal to trajectory

S = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.30	1.0	.100E+04	.01	3.05

OF MOD201: DIFFUSER DISCHARGE MODULE

IN MOD277: UNSTABLE NEAR-FIELD ZONE OF ALTERNATING PERPENDICULAR DIFFUSER

cause of the strong ambient current the diffuser plume of this crossflowing discharge gets RAPIDLY DEFLECTED.

near-field zone is formed that is VERTICALLY FULLY MIXED over the entire layer depth. Full mixing is achieved at a downstream distance of about five (5) layer depths.

ofile definitions:

BV = layer depth (vertically mixed)

BH = top-hat half-width, measured horizontally in y-direction

S = hydrodynamic average (bulk) dilution

C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.30	1.0	.100E+04	.01	3.05
.76	.00	.35	34.2	.292E+02	.16	3.05
1.52	.00	.40	47.5	.210E+02	.32	3.06
2.29	.00	.44	57.4	.174E+02	.47	3.06
3.05	.00	.49	65.4	.153E+02	.62	3.06
3.81	.00	.53	72.3	.138E+02	.77	3.06
4.57	.00	.58	78.3	.128E+02	.92	3.07
5.33	.00	.62	83.7	.119E+02	1.07	3.07
6.10	.00	.67	88.6	.113E+02	1.22	3.07
6.86	.00	.72	93.1	.107E+02	1.37	3.08
7.62	.00	.76	97.3	.103E+02	1.52	3.08

mulative travel time = 101. sec

OF MOD277: UNSTABLE NEAR-FIELD ZONE OF ALTERNATING PERPENDICULAR DIFFUSER

End of NEAR-FIELD REGION (NFR) **

N MOD241: BUOYANT AMBIENT SPREADING

charge is non-buoyant or weakly buoyant. therefore BUOYANT SPREADING REGIME is ABSENT.

OF MOD241: BUOYANT AMBIENT SPREADING

N MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

vertical diffusivity (initial value) = .935E-02 m^2/s
horizontal diffusivity (initial value) = .117E-01 m^2/s

passive diffusion plume is VERTICALLY FULLY MIXED at beginning of region.

file definitions:

σ_V = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
 = or equal to layer depth, if fully mixed

$H = \text{Gaussian s.d.} * \sqrt{\pi/2}$ (46%) half-width,
measured horizontally in Y-direction

Θ = upper plume boundary (Z-coordinate)

ZL = lower plume boundary (Z-coordinate)

S. = hydrodynamic centerline dilution

= centerline concentration (includes reaction effects, if any)

ime Stage 1 (not bank attached) :

X	Y	Z	S	C	BV	BH	ZU	ZL
8.38	.00	1.52	96.4	.104E+02	1.52	3.08	1.52	.00
28.42	.00	1.52	101.1	.989E+01	1.52	3.79	1.52	.00
48.47	.00	1.52	107.7	.929E+01	1.52	4.39	1.52	.00
68.51	.00	1.52	115.9	.863E+01	1.52	4.92	1.52	.00
88.55	.00	1.52	125.6	.796E+01	1.52	5.39	1.52	.00
108.59	.00	1.52	136.4	.733E+01	1.52	5.83	1.52	.00
128.64	.00	1.52	148.3	.674E+01	1.52	6.24	1.52	.00
148.68	.00	1.52	161.1	.621E+01	1.52	6.62	1.52	.00
168.72	.00	1.52	174.5	.573E+01	1.52	6.98	1.52	.00
188.76	.00	1.52	188.5	.531E+01	1.52	7.32	1.52	.00
208.80	.00	1.52	202.8	.493E+01	1.52	7.65	1.52	.00

Cumulative travel time = 143%, sec

time Stage 2 (bank attached) :

X Y Z S C BV BH ZU ZL
 208.80 7.65 1.52 202.9 .493E+01 1.52 15.30 1.52 .00
 270.00 7.65 1.52 217.1 .472E+01 1.52 15.73 1.52 .00
 cumulative travel time = 1845 sec

RMIX prediction has been TERMINATED at last prediction interval.
Limiting time due to TIDAL REVERSAL has been reached.

OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Attachment 9 10/24

DESCRIPTION	ZAPATA^VA0003867
name/label:	SLACK^TIDE^SHORT^DIFFUSER
ign case:	cormix\sim\ZAPATA2 .cx2
NAME:	
of Fortran run:	09/16/98--16:08:28

ENVIRONMENT PARAMETERS (metric units)

00 ICHREG-1

al Simulation at TIME = .000 h
 IOD= 12.40 h UAmaz = .300 dUa/dt= .150. (m/s)/h
 IOD= .000 F = .334 USTAR = .0000E+00
 IOD= .000 UWSTAR= .2198E-02

form density environment
CND= U RHOAM = 999.7000

USER DISCHARGE PARAMETERS (metric units)

USER DISCHARGE PARAMETERS
 fuser type: DITYPE= alternating perpendicular
 K = LEFT DISTB = 7.65 YB1 = 4.60 YB2 = 10.70
 = 6.10 NOOPEN = 13 SPAC = .51
 = .100 A0 = .008 H0 = .30
 zle/port arrangement: alternating without fanning
 MA = 90.00 THETA = 90.00 SIGMA = .00 BETA = 90.00
 = .128 Q0 = .013 = .1310E-01
 O = 996.3187 DRHOQ0 = .3381E+01 GPO = .3317E-01
 = .1000E+04 CUNITS= PPB
 DLL = 1 KS = .0000E+00 KD = .0000E+00

VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
- 2148E-02 m0 = .2755E-03 j0 = .7123E-04 SIGNJ0= 1.0

Associated 2-d length scales (meters)

C VARIABLES - ENTIRE DIFFUSER (metric units)
 = .1310E-01 M0 = .1681E-02 J0 = .4345E-03
 associated 3-d length scales (meters)
 = .32 LM = .40 Lm = 99999.00 Lb = 99999.00
 Lmp = 99999.00 Lbp = 99999.00
 6707 b Lu = 3.432 Lmin = .137

ial: Tu = -0.797 ln Bu + 0.001

-DIMENSIONAL PARAMETERS
D = 5.44 FRD0 = .22 R = 99999.00
Tot) (port/nozzle)

EXPOSURE ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS

= .1000E+04 CUNITS= PPB
 = 0
 = 0
 Z = 0
 = 6000.00 XMAX = 6000.00

COORDINATE SYSTEM:

ORIGIN is located at the bottom and the diffuser mid-point:

7.65 m from the LEFT bank/shore.

X-axis points downstream, Y-axis points to left, Z-axis points upward.

= 10 display intervals per module

OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

Initial conditions for individual jet/plume:

Average spacing between jet/plumes: .51 m

X	Y	Z	S	C	BV	BH
.00	.00	.30	1.0	.100E+04	.05	.05

OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

N CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

/plume transition motion in weak crossflow.

e of flow establishment:		THETAE=	90.00	SIGMAE=	.00		
=	.00	XE =	.00	YE =	.00	ZE =	.30

file definitions:

IV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory

IH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
normal to trajectoryafter merging: top-hat half-width in horizontal plane
parallel to diffuser line

; = hydrodynamic centerline dilution

; = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
Individual jet/plumes before merging:						
.00	.00	.30	1.0	.100E+04	.05	.05
.00	.00	.41	1.1	.877E+03	.06	.06
.00	.00	.52	1.5	.669E+03	.07	.07
.00	.00	.62	1.9	.526E+03	.08	.08
.00	.00	.73	2.3	.426E+03	.09	.09
.00	.00	.84	2.8	.353E+03	.10	.10
.00	.00	.94	3.4	.298E+03	.11	.11
.00	.00	1.05	3.9	.255E+03	.12	.12
.00	.00	1.16	4.5	.222E+03	.13	.13
.00	.00	1.27	5.1	.195E+03	.14	.14
.00	.00	1.37	5.8	.173E+03	.15	.15

Cumulative travel time = 7. sec

Merging of individual jet/plumes not found in this module, but interaction
will occur in following module. Overall jet/plume interaction dimensions:

.00	.00	1.37	5.8	.173E+03	.15	3.10
-----	-----	------	-----	----------	-----	------

OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Unlegislated
Attachment 12/24.

MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

tical angle of layer/boundary impingement" = 90.00 deg
horizontal angle of layer/boundary impingement" = .00 deg

charge into STAGNANT AMBIENT environment:

STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
even though some ADDITIONAL DILUTION MAY OCCUR!

also, all far-field processes will be UNSTEADY.

ULATION STOPS because of stagnant ambient conditions.

F MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

END OF NEAR-FIELD REGION (NFR) **

ULATION STOPS because of STAGNANT AMBIENT conditions.

far-field processes will be UNSTEADY.

IX2: Submerged Multiport Diffuser Discharges End of Prediction File

X2 PREDICTION FILE:

CORNELL MIXING ZONE EXPERT SYSTEM

System CORMIX2:

Merged Multiport Diffuser Discharges

CORMIX v.3.20

Subsystem version:
September 1996

DESCRIPTION

name/label: ZAPATA^VA0003867
 sign case: BEFORE^SLACK^SHORT^DIFFUSER
 S NAME: cormix\sim\ZAPATA3 .cx2
 e of Fortran run: 09/16/98--16:10:17

ENVIRONMENT PARAMETERS (metric units)

nded section
 = 503.00 AS = 766.57 QA = 114.99 ICHREG= 1
 = 1.52 HD = 1.52
 al Simulation at TIME = -1.000 h
 IOD= 12.40 h UAmaz = .300 dUa/dt= .150 (m/s)/h
 = .150 F = .334 USTAR = .3065E-01
 = .2.000 UWSTAR= .2198E-02

form density environment

CND= U RHOAM = 999.7000

USER DISCHARGE PARAMETERS (metric units)

fuser type: DITYPE= alternating perpendicular
 K = LEFT DISTB = 7.65 YB1 = 4.60 YB2 = 10.70
 = 6.10 NOOPEN = 13 SPAC = .51
 = .100 AO = .008 H0 = .30
 zle/port arrangement: alternating without fanning
 MA = 90.00 THETA = 90.00 SIGMA = .00 BETA = 90.00
 = .128 Q0 = .013 = .1310E-01
 O = 996.3187 DRHOO = .3381E+01 GPO = .3317E-01
 = .1000E+04 CUNITS= PPB
 = .1 KS = .0000E+00 KD = .0000E+00
 ALL = .1

VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)

= .2148E-02 m0 = .2755E-03 j0 = .7123E-04 SIGNJ0= 1.0
 associated 2-d length scales (meters)
 = .017 1M = .15 lm = .01
 = 99999.00 lbp = 99999.00 la = 99999.00

VARIABLES - ENTIRE DIFFUSER (metric units)

= .1310E-01 M0 = .1681E-02 J0 = .4345E-03
 associated 3-d length scales (meters)
 = .32 LM = .40 Lm = .27 Lb = .13
 = Lmp = 99999.00 Lbp = 99999.00 Lmin = .137

ial:

DIMENSIONAL PARAMETERS

= 5.44 FRD0 = 2.22 R = .85
 (port/nozzle)

CLASSIFICATION

Flow class (CORMIX2) = MU8 2
 Applicable layer depth HS = 1.52 2
 ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS

```
= .1000E+04 CUNITS= PPB
= 0
= 0
Z = 0
= 6000.00 XMAX = 6000.00
```

COORDINATE SYSTEM:

RIGIN is located at the bottom and the diffuser mid-point:

7.65 m from the LEFT bank/shore.

X-axis points downstream, Y-axis points to left, Z-axis points upward.

= 10 display intervals per module

OF MOD201: DIFFUSER DISCHARGE MODULE

to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

file definitions:

= Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory

= top-hat half-width, in horizontal plane normal to trajectory

= hydrodynamic centerline dilution

= centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.30	1.0	.100E+04	.01	3.05

OF MOD201: DIFFUSER DISCHARGE MODULE

OF MOD277: UNSTABLE NEAR-FIELD ZONE OF ALTERNATING PERPENDICULAR DIFFUSER

cause of the strong ambient current the diffuser plume of this crossflowing discharge gets RAPIDLY DEFLECTED. The near-field zone is formed that is VERTICALLY FULLY MIXED over the entire layer depth. Full mixing is achieved at a downstream distance of about five (5) layer depths.

file definitions:

= layer depth (vertically mixed)

= top-hat half-width, measured horizontally in y-direction

= hydrodynamic average (bulk) dilution

= average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.30	1.0	.100E+04	.01	3.05
.76	.00	.35	34.6	.289E+02	.16	3.05
1.52	.00	.40	48.4	.207E+02	.32	3.06
2.29	.00	.44	58.9	.170E+02	.47	3.06
3.05	.00	.49	67.8	.148E+02	.62	3.06
3.81	.00	.53	75.5	.132E+02	.77	3.06
4.57	.00	.58	82.5	.121E+02	.92	3.07
5.33	.00	.62	88.9	.112E+02	1.07	3.07
6.10	.00	.67	94.8	.105E+02	1.22	3.07
6.86	.00	.72	100.4	.996E+01	1.37	3.08
7.62	.00	.76	105.6	.947E+01	1.52	3.08

cumulative travel time = 101. sec

OF MOD277: UNSTABLE NEAR-FIELD ZONE OF ALTERNATING PERPENDICULAR DIFFUSER

** NFR REGION (NFR) **

MOD241: BUOYANT AMBIENT SPREADING

:charge is non-buoyant or weakly buoyant.
Therefore BUOYANT SPREADING REGIME is ABSENT.

OF MOD241: BUOYANT AMBIENT SPREADING

J MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

horizontal diffusivity (initial value) = .117E-01 m^2/s

passive diffusion plume is VERTICALLY FULLY MIXED at beginning of region.

file definitions:

V = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
 = or equal to layer depth, if fully mixed
 H = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
 measured horizontally in Y-direction
 U = upper plume boundary (Z-coordinate)
 L = lower plume boundary (Z-coordinate)
 C = hydrodynamic centerline dilution
 = centerline concentration (includes reaction effects, if any)

me Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
8.38	.00	1.52	105.4	.949E+01	1.52	3.08	1.52	.00
28.42	.00	1.52	126.0	.794E+01	1.52	3.79	1.52	.00
48.47	.00	1.52	143.4	.698E+01	1.52	4.39	1.52	.00
68.51	.00	1.52	159.2	.628E+01	1.52	4.92	1.52	.00
88.55	.00	1.52	174.1	.574E+01	1.52	5.39	1.52	.00
108.59	.00	1.52	188.4	.531E+01	1.52	5.83	1.52	.00
128.64	.00	1.52	202.3	.494E+01	1.52	6.24	1.52	.00
148.68	.00	1.52	215.7	.464E+01	1.52	6.62	1.52	.00
168.72	.00	1.52	228.8	.437E+01	1.52	6.98	1.52	.00
188.76	.00	1.52	241.5	.414E+01	1.52	7.32	1.52	.00
208.80	.00	1.52	253.8	.394E+01	1.52	7.65	1.52	.00

Cumulative travel time = 1437. sec

same Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
208.80	7.65	1.52	253.8	.394E+01	1.52	15.30	1.52	.00
235.64	7.65	1.52	257.7	.389E+01	1.52	15.49	1.52	.00

cumulative travel time = 1616. sec

RMix prediction has been TERMINATED at last prediction interval.
Limiting distance due to TIDAL REVERSAL has been reached.

OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Attachment 16/24

DESCRIPTION ZAPATA^VA0003867
name/label:
gn case:
NAME: cormix\sim\ZAPATA4 .cx2
of Fortran run: 09/16/98--15:18:57

ENVIRONMENT PARAMETERS (metric units)

ded section = 766.57 OA = 114.99 ICHREG= 1

```

= 503.00 AS = 768.57
= 1.52 HD = 1.52
1 Simulation at TIME = 1.000 h
OD= 12.40 h UAmaz = .300 dUa/dt=.150 (m/s)/h
= .150 F = .334 USTAR = .3065E-01
= 2.000 UWSTAR=.2198E-02

```

Form density environment
RHOAM = 999.7000

JSER DISCHARGE PARAMETERS (metric units)
 fuser type: DITYPE= unidirectional perpendicular
 K = LEFT DISTB = 12.20 YB1 = 6.10 YB2 = 18.30
 = 12.20 NOPEN = 8 SPAC = 1.74
 = .100 A0 = .008 H0 = .28
 zle/port arrangement: unidirectional without fanning
 MA = 90.00 THETA = 45.00 SIGMA = .00 BETA = 90.00
 = .208 Q0 = .013 = .1310E-01
 O = .996.3187 DRHOO = .3381E+01 GPO = .3317E-01
 = .1000E+04 CUNITS= PPB
 LL = 1 KS = .0000E+00 KD = .0000E+00

VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
= .1074E-02 m0 = .2239E-03 j0 = .3561E-04 SIGNJ0= 1.0
= .1074E-02 m0 = .2239E-03 j0 = .3561E-04 SIGNJ0= 1.0
= .1074E-02 m0 = .2239E-03 j0 = .3561E-04 SIGNJ0= 1.0

Associated 2-d length scales (meters)
B = .005 lM = .21 lm = .01
= 99999.00 lbp = 99999.00 la = 99999.00

VARIABLES - ENTIRE DIFFUSER (metric units)
 = .1310E-01 M0 = .2731E-02 J0 = .4345E-03
 sociated 3-d length scales (meters)
 = .25 LM = .57 Lm = .35 Lb = .13
 Lmp = 99999.00 Lbp = 99999.00
 Tu = .0864 h Lu = 4.033 Lmin = .174

3a1:

-DIMENSIONAL PARAMETERS
0 = 15.95 FRD0 = 3.62 R = 1.38
lot) (port/nozzle)

W CLASSIFICATION

ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS

Attachment 17/24

= .1000E+04 CUNITS= PPB
= 0
= 0
Z = 0
= 6000.00 XMAX = 6000.00

COORDINATE SYSTEM:

ORIGIN is located at the bottom and the diffuser mid-point:

12.20 m' from the LEFT bank/shore.

-axis points downstream, Y-axis points to left, Z-axis points upward.

= 10 display intervals per module

MOD201: DIFFUSER DISCHARGE MODULE

to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

file definitions:

= Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory

= top-hat half-width, in horizontal plane normal to trajectory

= hydrodynamic centerline dilution

= centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.28	1.0	.100E+04	.00	6.10

OF MOD201: DIFFUSER DISCHARGE MODULE

MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = 1.52m).

All mixing is achieved after a plume distance of about five layer depths from the diffuser.

file definitions:

= layer depth (vertically mixed)

= top-hat half-width, in horizontal plane normal to trajectory

= hydrodynamic average (bulk) dilution

= average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.28	1.0	.100E+04	.00	6.10
.61	.00	.33	67.6	.148E+02	.15	6.09
1.22	.00	.38	94.5	.106E+02	.30	6.09
1.83	.00	.42	114.6	.873E+01	.46	6.09
2.44	.00	.47	131.1	.763E+01	.61	6.09
3.05	.00	.52	145.3	.688E+01	.76	6.08
3.66	.00	.57	157.9	.633E+01	.91	6.08
4.27	.00	.62	169.3	.591E+01	1.07	6.08
4.88	.00	.67	179.6	.557E+01	1.22	6.08
5.49	.00	.71	189.1	.529E+01	1.37	6.08
6.10	.00	.76	197.9	.505E+01	1.52	6.08

ulative travel time = 40. sec

OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

2. The flow has RESTRATIFIED at the beginning of this zone.

flow region is INSIGNIFICANT in spatial extent, and will be by-passed.

E MOD251: DIFFUSER PLUME IN CO-FLOW

----- d of NEAR-FIELD REGION (NFR) **

MOD241: BUOYANT AMBIENT SPREADING

charge is non-buoyant or weakly buoyant. Therefore BUOYANT SPREADING REGIME is ABSENT.

DE MOD241: BUOYANT AMBIENT SPREADING

MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Vertical diffusivity (initial value) = .935E-02 m^2/s
Horizontal diffusivity (initial value) = .117E-01 m^2/s

horizontal diffusivity (initial value).
passive diffusion plume is VERTICALLY FULLY MIXED at beginning of region.

file definitions:
 V = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
 = or equal to layer depth, if fully mixed
 H = Gaussian s.d.*sqrt(pi/2), (46%) half-width,
 measured horizontally in Y-direction
 U = upper plume boundary (Z-coordinate)
 L = lower plume boundary (Z-coordinate)
 ; = hydrodynamic centerline dilution
 : = centerline concentration (includes reaction effects, if any)

same Stage 1 (not bank attached):

Time	Stage	X	Y	Z	S	C	BV
6.19		.00	1.52	197.9	.505E+01	1.52	6.12	1.52	.00	
51.64		.00	1.52	171.2	.584E+01	1.52	6.97	1.52	.00	
97.17		.00	1.52	180.0	.555E+01	1.52	7.73	1.52	.00	
142.71		.00	1.52	201.2	.497E+01	1.52	8.42	1.52	.00	
188.24		.00	1.52	228.7	.437E+01	1.52	9.05	1.52	.00	
210.07		.00	1.52	243.4	.412E+01	1.52	9.34	1.52	.00	
					1400. sec					

... at last prediction interval.

Rmix prediction has been TERMINATED at last prediction in
Limiting distance due to TIDAL REVERSAL has been reached.

OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Attachment 19/24

X2 PREDICTION FILE:

/stem CORMIX2:
merged Multiport Diffuser Discharges CORMIX v.3.20 Subsystem-version:
September 1996

DESCRIPTION

name/label:	ZAPATA^VA0003867
ign case:	SLACK^-^LONG^DIFFUSER
E NAME:	cormix\sim\ZAPATA5 .cx2
e of Fortran run:	09/16/98--15:24:46

ENVIRONMENT PARAMETERS (metric units)

nded section

= 503.00 AS = 766.57 QA = .00 ICHREG= 1
 = 1.52 HD = 1.52
 al Simulation at TIME = .000 h
 IOD= 12.40 h UAmaz = .300 dUa/dt= .150 (m/s)/h
 = .000 F = .334 USTAR = .0000E+00
 = 2.000 UWSTAR= .2198E-02

form density environment

CND= U RHOAM = 999.7000

USER DISCHARGE PARAMETERS (metric units)

fuser type: DITYPE= unidirectional perpendicular
 K = LEFT DISTB = 12.20 YB1 = 6.10 YB2 = 18.30
 = 12.20 NOOPEN = 8 SPAC = 1.74
 = .100 A0 = .008 H0 = .28
 nozzle/port arrangement: unidirectional without fanning
 IMA = 90.00 THETA = 45.00 SIGMA = .00 BETA = 90.00
 = .208 Q0 = .013 = .1310E-01
 00 = 996.3187 DRHO0 = .3381E+01 GPO = .3317E-01
 = .1000E+04 CUNITS= PPB
 OLL = 1 KS = .0000E+00 KD = .0000E+00

VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)

= .1074E-02 : MO = .2239E-03 JO = .3561E-04 SIGNJO= 1.0

associated 2-d length scales (meters)

=B = .065-1M n = .21 1m = 99999.00

3 = 99999.00 lbp = 99999.00 la = 99999.00

K VARIABLES - ENTIRE DIFFUSER (metric units)

= .1310E-01 MO = .2731E-02 JO = .4345E-03

sociated 3-d length scales (meters)

= .25 LM = .57 Lm = 99999.00 Lb = 99999.00
Lmp = 99999.00 Lbp = 99999.00

dal: Tu = .0864 h Lu = 4.033 Lmin = .174

0 = 15 95 EBDO

: (port/nozzle)

(port, nozzle)

W CLASSIFICATION
202020202020202020

Elm place (GORMIX2) = MU1V 3

Flow class (CURMIX2) = MU1V 2
undrivable layer depth US = 1.53 3

Applicable layer depth HS = 1.52 Z

ING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS

20/24
Omega fact
Sheet
Attachment
9

```
= .1000E+04 CUNITS= PPB
= 0
= 0
Z = 0
= .6000.00 XMAX = .6000.00
```

COORDINATE SYSTEM:

RIGIN is located at the bottom and the diffuser mid-point:
 12.20 m from the LEFT bank/shore.

-axis points downstream, Y-axis points to left, Z-axis points upward.
 = 10 display intervals per module

I MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

X	Y	Z	S	C	BV	BH
.00	.00	.28	1.0	.100E+04	.05	.05

OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

J CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

plume transition motion in weak crossflow.

= of flow establishment: THETAE= 45.00 SIGMAE= .00
 = .00 XE = .00 YE = .00 ZE = .28

File definitions:

J = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
 H = before merging: Gaussian 1/e (37%) half-width in horizontal plane
 normal to trajectory
 after merging: top-hat half-width in horizontal plane
 parallel to diffuser line
 = hydrodynamic centerline dilution
 = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
individual jet/plumes before merging:						
.00	.00	.28	1.0	.100E+04	.05	.05
.08	.00	.37	1.1	.900E+03	.06	.06
.15	.00	.46	1.4	.703E+03	.08	.08
.21	.00	.57	1.8	.566E+03	.09	.09
.26	.00	.67	2.2	.465E+03	.10	.10
.31	.00	.78	2.6	.390E+03	.11	.11
.35	.00	.89	3.0	.331E+03	.12	.12
.39	.00	1.01	3.5	.286E+03	.14	.14
.42	.00	1.12	4.0	.249E+03	.15	.15
.45	.00	1.24	4.6	.220E+03	.16	.16
.48	.00	1.35	5.1	.195E+03	.17	.17

cumulative travel time = 6. sec

merging of individual jet/plumes not found in this module, but interaction will occur in following module. Overall jet/plume interaction dimensions:

.48	.00	1.35	5.1	.195E+03	.17	6.15
-----	-----	------	-----	----------	-----	------

OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

N MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

tical angle of layer/boundary impingement = 77.35° deg
 horizontal angle of layer/boundary impingement = .00 deg

21/24
Attainment q

charge into STAGNANT AMBIENT environment:

STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
even though some ADDITIONAL DILUTION MAY OCCUR!

Also, all far-field processes will be UNSTEADY.
NUALATION STOPS because of stagnant ambient conditions.

OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

1d of NEAR-FIELD REGION (NFR) **

ULATION STOPS because of STAGNANT AMBIENT conditions.

far-field processes will be UNSTEADY.

:X2: Submerged Multiport Diffuser Discharges . End of Prediction File

22/24
Attachment a

X2 PREDICTION FILE:

/stem CORMIX2: Subsystem version:
merged Multiport Diffuser Discharges CORMIX v.3.20 September 1996

DESCRIPTION

name/label: ZAPATA^VA0003867
ign case: BEFORE^SLACK^-^LONG^DIFFUSER
S NAME: cormix\sim\ZAPATA6 .cx2
e of Fortran run: 09/16/98--15:26:42

ENVIRONMENT PARAMETERS (metric units)

ended section

= 503.00 AS = 766.57 QA = 114.99 ICHREG= 1
 = 1.52 HD = 1.52
 al Simulation at TIME = -1.000 h
 IOD= 12.40 h UAmaz = .300 dUa/dt= .150 (m/s)/h
 = .150 F = .334 USTAR = .3065E-01
 = 2.000 INWSTAR= 2198E-02

**2,000 ORGANIC
farm density environment**

CND = II RHOAM = 999.7000

USER DISCHARGE PARAMETERS (metric units)

fuser type: DITYPE= unidirectional perpendicular
 K = LEFT DISTB = 12.20 YB1 = 6.10 YB2 = 18.30
 = 12.20 NOPEN = 8 SPAC = 1.74
 = .100 A0 = .008 H0 = .28
 zle/port arrangement: unidirectional without fanning
 MA = 90.00 THETA = 45.00 SIGMA = .00 BETA = 90.00
 = .208 Q0 = .013 = .1310E-01
 0 = 996.3187 DRHOO = .3381E+01 GPO = .3317E-01
 = .1000E+04 CUNITS= PPB
 LL = 1 KS = .0000E+00 KD = .0000E+00

VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)

~~VARIABLES PER UNIT ELEVATION LEVEL (metres above)~~
~~= .1074E-02 m0 = .2239E-03 j0 = .3561E-04 SIGNJ0= 1.0~~
~~ociated 2-d length scales (meters)~~

ociated 2-d length scales (meters)

B = .005 1M = .21 1m = .01
= 99999.00 lbp = 99999.00 la = 99999.00

VARIABLES - ENTIRE DIFFUSER (metric units)

= .1310E-01 MO = .2731E-02 JO = .4345E-03

ociated 3-d length scales (meters)

= .25 LM = .57 Lm = .35 Lb = .13
Lmp t 99999.00 Lbp t 99999.00

$T_{11} = 2864 \text{ h}$, $I_{11} = 4,033 \text{ I-min}$, $\tau = 124$

DIMENSIONAL PARAMETERS

$$= \frac{15.95}{(port/nozzle)} FRDO = 3.62 \quad R = 1.38$$

1 CLASSIFICATION

Flow class (CORMIX2) = MU2 2

Applicable layer depth HS = 1.52

Digitized by srujanika@gmail.com

```

= .1000E+04 CUNITS= PPB
;
= 0
= 0
tZ = 0
T = 6000:00 XMAX = 6000.00

```

Z COORDINATE SYSTEM:

ORIGIN is located at the bottom and the diffuser mid-point:

12.20 m from the LEFT bank/shore.

X-axis points downstream, Y-axis points to left, Z-axis points upward.

P = 10 display intervals per module

N MOD201: DIFFUSER DISCHARGE MODULE

to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

file definitions:

N = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory

H = top-hat half-width, in horizontal plane normal to trajectory

D = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.28	1.0	.100E+04	.00	6.10

OF MOD201: DIFFUSER DISCHARGE MODULE

IN MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = 1.52m).

Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

file definitions:

BV = layer depth (vertically mixed)

BH = top-hat half-width, in horizontal plane normal to trajectory

S = hydrodynamic average (bulk) dilution

C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.28	1.0	.100E+04	.00	6.10
.61	.00	.33	68.1	.147E+02	.15	6.09
1.22	.00	.38	95.8	.104E+02	.30	6.09
1.83	.00	.42	116.9	.855E+01	.46	6.09
2.44	.00	.47	134.7	.742E+01	.61	6.09
3.05	.00	.52	150.3	.665E+01	.76	6.08
3.66	.00	.57	164.3	.609E+01	.91	6.08
4.27	.00	.62	177.2	.564E+01	1.07	6.08
4.88	.00	.67	189.1	.529E+01	1.22	6.08
5.49	.00	.71	200.3	.499E+01	1.37	6.08
6.10	.00	.76	210.8	.474E+01	1.52	6.08

Simulative travel time = 40. sec

D OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

GIN MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

se 2: The flow has RESTRATIFIED at the beginning of this zone.

~~s flow region is INSIGNIFICANT in spatial extent and will be by-passed.~~

CF MOD251: DIFFUSER PLUME IN CO-FLOW

nd of NEAR-FIELD REGION (NFR) **

N MOD241: BUOYANT AMBIENT SPREADING

charge is non-buoyant or weakly buoyant

herefore BUOYANT SPREADING REGIME is ABSENT.

OF MOD241: BUOYANT AMBIENT SPREADING

N MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

vertical diffusivity (initial value) = .935E-02 m^2/s
horizontal diffusivity (initial value) = .117E-01 m^2/s

: passive diffusion plume is VERTICALLY FULLY MIXED at beginning of region.

>file definitions:

δV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed

βH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction .

Z_U = upper plume boundary (Z-coordinate)

ZL = lower plume boundary (Z-coordinate)

δ = hydrodynamic centerline dilution

C = centerline concentration (includes reaction effects, if any)

June Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
6.10	.00	1.52	210.8	.474E+01	1.52	6.12	1.52	.00
51.64	.00	1.52	227.8	.439E+01	1.52	6.97	1.52	.00
97.17	.00	1.52	249.6	.401E+01	1.52	7.73	1.52	.00
142.71	.00	1.52	273.5	.366E+01	1.52	8.42	1.52	.00
188.24	.00	1.52	297.7	.336E+01	1.52	9.05	1.52	.00
233.78	.00	1.52	321.4	.311E+01	1.52	9.65	1.52	.00
238.07	.00	1.52	323.5	.309E+01	1.52	9.70	1.52	.00

cumulative travel time = 1587. sec

RMIX prediction has been TERMINATED at last prediction interval.
Limiting distance due to TIDAL REVERSAL has been reached.

OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

MIX2: Submerged Multiport Diffuser Discharges End of Prediction File

Jon VanSoestbergen@RCHMD@DEQ

: Maynard D. Phillips@WPS@DEQ
ect: Monday, September 28, 1998 8:45:07 EDT
: ch:
ify: N
arded by: Jon VanSoestbergen@RCHMD@DEQ

arded to: Denise M. Mosca@KLMCK@DEQ
cc: Maynard D. Phillips@WPS@DEQ
arded date: Monday, September 28, 1998 10:23:12 EDT
ments by: Jon VanSoestbergen@RCHMD@DEQ
ments:

lse:

Following are Dale's comments regarding my 9/17/1998 memo and work on the ita wasteload allocation review and CORMIX analysis. If you include this mail as part of the file I don't see any reason to rewrite my 9/17/1998. Could you please make a copy of the 9/17/1998 memo and attachment (24 es) and send it to me. I forgot to make a copy before I gave you the cage when you were here last week.

address Dale's comments/questions:

s's explanation as to why the long diffuser is better should be adequate umentation regarding this issue.

circular mixing zone I describe in my 9/17/1998 is as measured from the point of the diffuser. CORMIX defines the origin of the coordinate (x-y-plane) as this point. S (the hydrodynamic centerline dilution) is then as sured from this origin. Therefore, I believe my definition of the mixing e as a circle measured around the diffuser midpoint is not incorrect. ever, describing the mixing zone as extending from the diffuser in any ection is also acceptable, and would have the effect only of extending the ndary slightly further out in the y-direction toward the middle of the eam, in theory resulting in a slightly larger mixing zone. Practically, ough, the difference between the two is of the order of 10 feet in the y- ection, which in the context of water quality monitoring and model uracy is negligible. In any event, the final defined mixing zone will be unction of the final diffuser design submitted by Zapata. You should vide this final design to me for analysis when it is received, unless some t of mixing zone analysis is provided as documentation with the design.

ill consider this e-mail as finalizing my 9/17/1998 memorandum and my work this project. If you have any questions or need additional information, use don't hesitate to call me.

Attachment 9

Maynard D. Phillips@WPS@DEQ
Denise M. Mosca@KLMCK@DEQ
Curtis J. Linderman@RCHMD@DEQ

To: Jon VanSoestbergen@RCHMD@DEQ
Subject: Zapata CORMIX analysis
Date: Thursday, September 17, 1998 9:34:00 EDT
Priority: N
Submitted by:

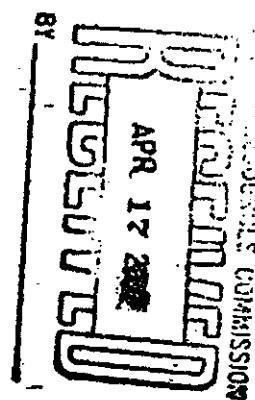
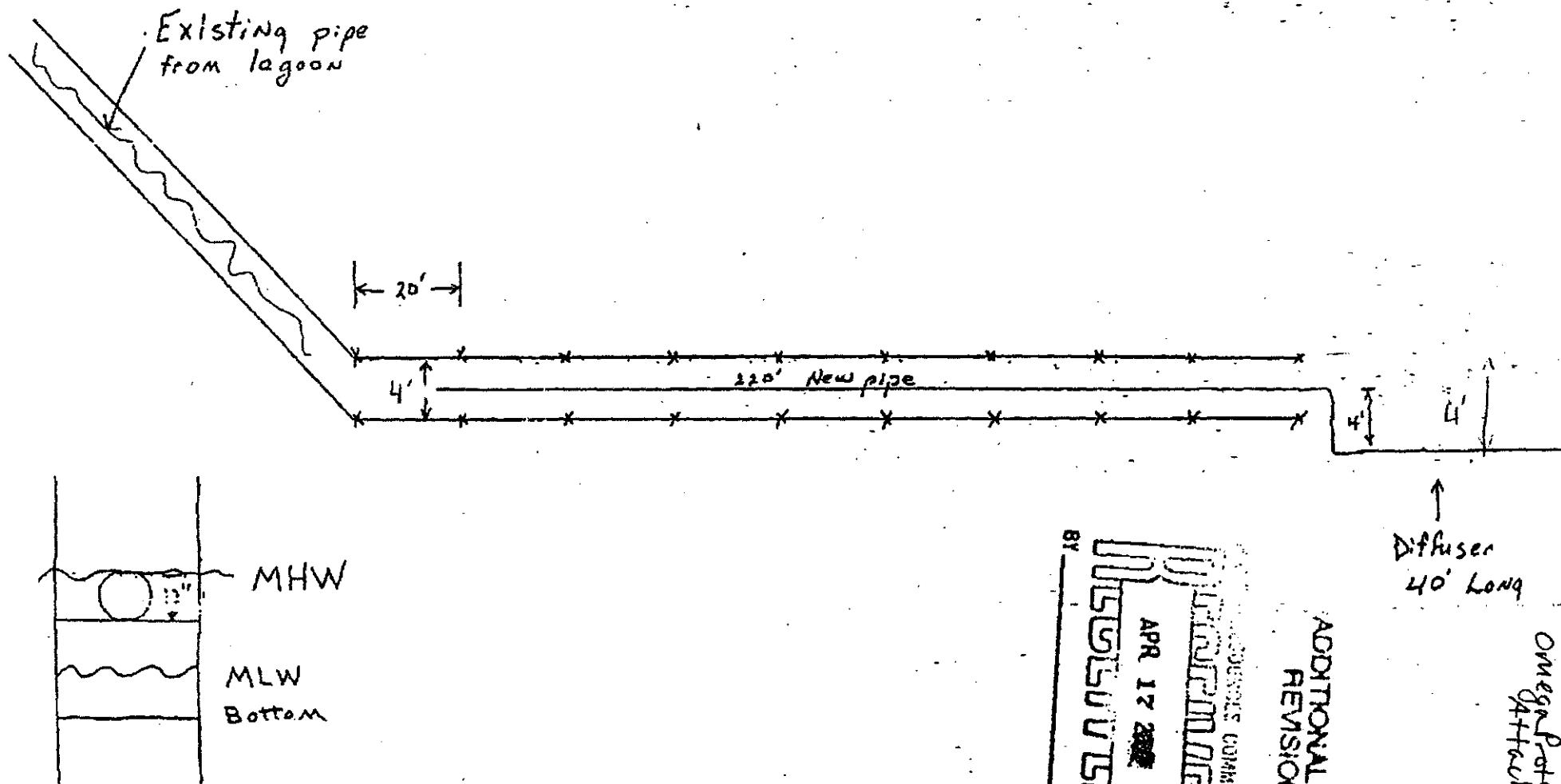
I am sending you the results of the CORMIX analysis I did for Zapata today. I have not yet sent the information to Denise pending your review. Please let me know if you have any concerns with the analysis. I will wait to send the package to Denise until I hear from you one way or the other.

In summary, I ended up analyzing two different diffuser designs. The first approximates the design that was included in the package provided by Denise, the second is a design of my own. The first ("short diffuser") results in a dilution ratio of 50:1. The second ("long diffuser") results in a dilution ratio of 100:1. The mixing zone for the first is 25 feet, for the second, 20 feet. The ratio used by the permit writer will depend on the final diffuser design selected by the permittee.

As we discussed yesterday, I analyzed each design 1 hr before slack tide, at slack tide, and 1 hr after slack tide. Then I averaged the most conservative results for each diffuser to obtain the final dilution ratio. This results in a dilution ratio based on a 1-hr average flow under critical conditions, which best reflects the way the acute standard is written. My recommendation is that the selected dilution ratio be used for both acute and chronic WLA determination.

Thanks for your help on this.

CROSS SECTION VIEW ---
 Omega Protein
 Shown without walkway
 NOT to scale



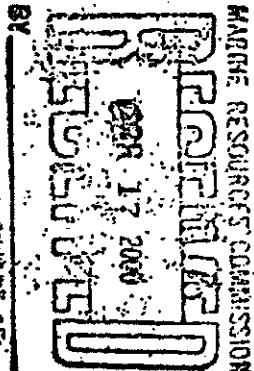
ADDITIONAL INFO
REVISION

40000/0000
Omega Protein
Attachment 9

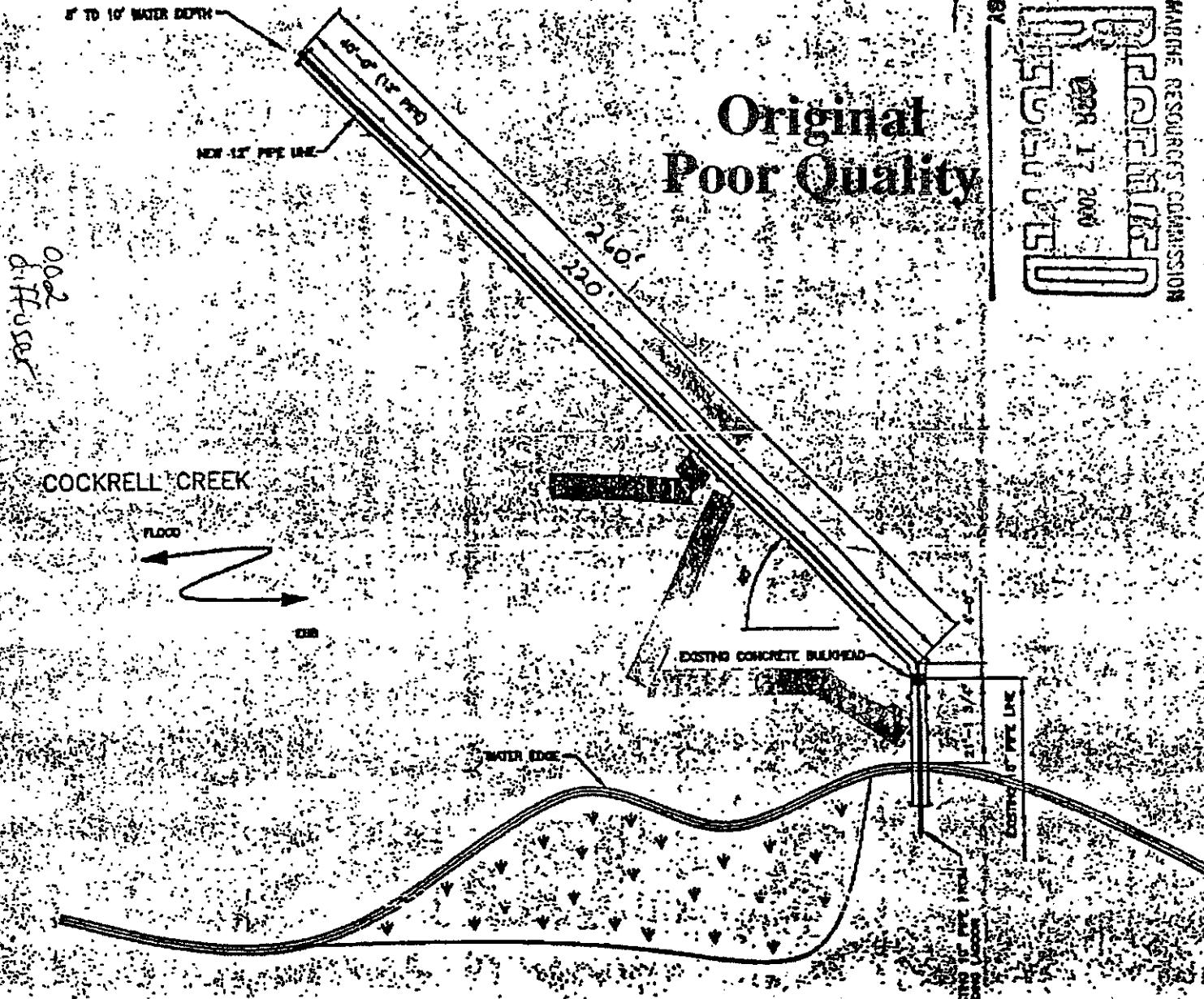
ADDITIONAL INFO

- REVISION

002/003



Original Poor Quality



ATTACHMENT H

Effluent Limitation Development – Outfall 002

OUTFALL 002 LIMITATIONS CALCULATIONS BASED ON ELGs

Technology Based Limitations Calculations: Effluent limitations guidelines (ELGs) for technology based limitations for BOD, TSS, O&G and pH are provided in §408.152. The limitations below are calculated based on Best Practical Control Technology Currently Available (BPT), and on the production reported on EPA Form 2C (4.0 Million lbs/day = 1,814,369 Kg/day).

		Multiplier (Kg/1000 Kg)	Calculated Limit [(1,814,369 X multiplier)/1,000] (Kg/d)
BOD₅	Avg	3.9	7,076
	Max	7.0	12,700
TSS	Avg	1.5	2,721
	Max	3.7	6,713
O&G	Avg	0.76	1,379
	Max	1.4	2,540

Water Quality Based Limitations Calculations: The 1976 VIMS model reported that loading to Cockrell Creek cannot exceed 5000 lb/d of cBOD₅ in order to protect water quality of the creek. The two menhaden plants (Zapata and Ampro, now merged as Omega) were allocated 4900 lb/day (2222.22 kg/d) of cBOD₅. In order to calculate a WQBL, it is necessary to assume that all cBOD₅ is equal to BOD₅. Because cBOD₅ is only one component of the total oxygen demanding process, this would reflect a conservative limiting assumption regarding cBOD₅ loading. This is necessary because the ELGs provide production based effluent emission factors in terms of BOD₅. Also it is necessary to perform WQBL calculations in terms of BOD₅ for purposes of comparison to the technology derived limitations to determine the more restrictive of technology based limitation or water quality based limitations.

The VIMS WLA of BOD₅ was used in calculation of maximum loading limitations. To obtain the BOD₅ maximum WLA, the average WLA of 4900 lbs/day was multiplied by the ratio of max BOD₅ multiplier (7) to average BOD₅ multiplier (3.9) as a conservative approach.

$$4900 \text{ lbs/d} * (7/3.9) = 8794.872 \text{ lbs/d (4000 kg/d) max WLA based on VIMS model WLA}$$

Comparison and Limitation Determination (kg/d)

		ELGs	WQBL	Current Permit Limitations
BOD₅	Mo Avg	7100	2200	470
	Max	13000	4000	840
TSS	Mo Avg	2700	NA	160
	Max	6700	NA	410
O&G	Mo Avg	1400	NA	25
	Max	2500	NA	46

The previous permit limitations were calculated using similar methods to the WQBL calculation as described above. At the time that those limitations were calculated, the facility discharged wastewater from Outfall 001 (contact cooling water) and limitations were based on proportions of loading from Outfall 001 and Outfall 002. Based on the anti-backsliding policy (9 VAC 25-31-220 L), permits may not be

renewed, reissued or modified to contain effluent limitations which are less stringent than the comparable effluent limits in the previous permit with some exceptions, including material and substantial alterations at the facility. The elimination of Outfall 001 is not considered a material and substantial alteration to the treatment train at Outfall 002 and is not related to the ability to achieve water quality performance levels previously demonstrated at Outfall 002. Therefore, the limitations for BOD₅, TSS, and O&G contained in the previous permit will be carried forward with this permit renewal with a basis of best professional judgment. Explanation of the previous permit limitation is attached below.

HOWEVER, WQS DICTATE TOTAL ALLOWABLE BOD DISCHARGE TO CREEK IS 499 LB/DAY AFTER THE WLA FOR THE REEDVILLE WWTP HAS BEEN SUBTRACTED. FRED CUNNINGHAM'S FACT SHEET DATED 6/29/84 ALLOWED A TOTAL OF 2223 KG/D. THIS HAS BEEN ALLOCATED IN ITS ENTIRETY TO OMEGA PROTEIN WITH THE 1997 PERMIT MODIFICATION.

THEREFORE THE SUM OF BOD FOR 001 AND 002, THE TWO PROCESS OUTFALLS DISCHARGING TO CREEK, CANNOT EXCEED 2223 KG/D, AND WQS LIMITS APPLY TO THESE 2 OUTFALLS. 003 IS LIMITED BY TECHNOLOGY LIMITS.

		Kg/d Total Wasteload Allocation 001+002 (from previous permit)	Scrubber 001 63.037 MGD	Lagoon 002 9.36 0.25 MGD
BODs	Avg	2223	001 BOD Loading/Total Loading = 0.7806 $2223 \times .7806 = 1755$ $1755 / 182.2 = 0.8782$ use 1755/rounded to 1700 Kg/d 002 BOD Loading/Total Loading = 0.2104 $2223 \times .2104 = 468$ use 468, rounded to 470 Kg/d	$2223 \times .1218 = 270.78$ use 270.78 Kg/d
Total BOD Loading* = 468 + 270.78 = 638.78 160 + 22.2 = 182.2 kg/d	Max	3979	$3979 \times .7806 = 3142$ $3979 \times .2104 = 837$ use 3142 rounded to 3100 Kg/d	$3979 \times .1218 = 485.88$ use 485.88 Kg/d
TSS	Avg	826	001 TSS Loading/Total Loading = 0.7024 $826 \times .7024 = 565$ $565 / 249.8 = 0.7066$ use 565, rounded to 560 002 TSS Loading/Total Loading = 0.2034 $826 \times .2034 = 168$ use 168, rounded to 160 Kg/d	$826 \times .2034 = 168$ use 168, rounded to 160 Kg/d
Total TSS Loading* = 416 + 100 = 516 199 + 50.8 = 249.8 kg/d	Max	2031	$2031 \times .7066 = 1460$ $2031 \times .2034 = 413.11$ use 1460, rounded to 1400 Kg/d	$2031 \times .2034 = 413.11$ use 413, rounded to 410 Kg/d
O&G	Avg	400	001 O&G Loading/Total Loading = 0.6309 $400 \times .6309 = 375$ $375 / 57.9 = .6378$ use 372, rounded to 370 002 O&G Loading/Total Loading = 0.0601 $3.657.9 \times .0601 = 222$ use 222, rounded to 220 Kg/d	$400 \times .0622 = 24.88$ use 24.88, rounded to 25 Kg/d
Total O&G Loading* = 401 + 7.5 = 408.5 54.3 + 3.8 = 57.9 Kg/d	Max	736	$736 \times .6378 = 469$ $736 \times .0601 = 45.76$ use 469, rounded to 460 Kg/d	$736 \times .0622 = 45.76$ use 45.76, rounded to 46 Kg/d

ELECTRONIC CODE OF FEDERAL REGULATIONS

[View past updates to the e-CFR.](#)
[Click here to learn more.](#)

e-CFR data is current as of February 8, 2016

[Title 40](#) → [Chapter I](#) → [Subchapter N](#) → [Part 408](#) → [Subpart O](#) → §408.152

[Browse Previous](#) | [Browse Next](#)

Title 40: Protection of Environment

PART 408—CANNED AND PRESERVED SEAFOOD PROCESSING POINT SOURCE CATEGORY
Subpart O—Fish Meal Processing Subcategory

§408.152 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

Except as provided in §§125.30 through 125.32, any existing point source subject to this subpart shall achieve the following effluent limitations representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available (BPT):

- (a) Any menhaden or anchovy fish meal reduction facility which utilizes a solubles plant to process stick water or bail water shall meet the following limitations.

Effluent characteristic	Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
Metric units (kilograms per 1,000 kg of seafood)		
BOD5	7.0	3.9
TSS	3.7	1.5
Oil and grease	1.4	0.76
pH	(¹)	(¹)
English units (pounds per 1,000 lb of seafood)		
BOD5	7.0	3.9
TSS	3.7	1.5
Oil and grease	1.4	0.76
pH	(¹)	(¹)

¹Within the range 6.0 to 9.0.

(b) Any menhaden or anchovy fish meal reduction facility not covered under §408.152(a) shall meet the following limitations:

Effluent characteristic	Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed—
Metric units (kg/kkg of seafood)		
BOD5	3.5	2.8
TSS	2.6	1.7
Oil and grease	3.2	1.4
pH	(¹)	(¹)
English units (lb/1,000 lb of seafood)		
BOD5	3.5	2.8
TSS	2.6	1.7
Oil and grease	3.2	1.4
pH	(¹)	(¹)

¹Within the range 6.0 to 9.0.

[40 FR 55781, Dec. 1, 1975, as amended at 41 FR 31821, July 30, 1976; 60 FR 33943, June 29, 1995]

VA0003867 – Omega Protein Inc.

MSTRANTI DATA SOURCE REPORT FOR OUTFALL 002

Stream Information:	Basis
Mean Hardness	Not Applicable for Salt Water
90 th % Temperature (Annual)	Ambient Data for Station 7-COC001.61
90 th % Temperature (Winter)	No Tiered Limitations, Not Applicable
90 th % Maximum pH	Ambient Data for Station 7-COC001.61
10 th % Maximum pH	Ambient Data for Station 7-COC001.61
Tier Designation	Flow Frequency Memorandum
Mean Salinity	Ambient Data for Station 7-COC001.61
Mixing Information:	
Design Flow	Maximum 30 Day Value as Reported in Form 2C Application
Acute WLA Multiplier	
Chronic WLA Multiplier	Diffuser Model Documentation September 1998
Human Health WLA Multiplier	
Effluent Information:	
Mean Hardness	Not Applicable for Salt Water
90 th % Temperature (Annual)	DMR Effluent Data
90 th % Temperature (Winter)	No Tiered Limitations, Not Applicable
90 th % Maximum pH	
10 th % Maximum pH	DMR Effluent Data
Discharge Flow	Maximum 30 Day Value as Reported in Form 2C Application

Facility Name: Omega Protein, Inc.

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
002	FLOW (MGD)	0.095	0.167	NULL	NULL	NULL	10-Dec-11	9-Dec-11
		0.072	0.104	NULL	NULL	NULL	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		0.14	0.21	NULL	NULL	NULL	10-Jun-12	8-Jun-12
		0.17	0.28	NULL	NULL	NULL	10-Jul-12	4-Jul-12
		0.15	0.22	NULL	NULL	NULL	10-Aug-12	8-Aug-12
		0.12	0.27	NULL	NULL	NULL	10-Sep-12	7-Sep-12
		0.22	0.495	NULL	NULL	NULL	10-Oct-12	4-Oct-12
		0.182	0.351	NULL	NULL	NULL	10-Nov-12	9-Nov-12
		0.067	0.159	NULL	NULL	NULL	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		0.161	0.287	NULL	NULL	NULL	10-Jul-13	1-Jul-13
		0.174	0.272	NULL	NULL	NULL	10-Aug-13	9-Aug-13
		0.186	0.315	NULL	NULL	NULL	10-Sep-13	9-Sep-13
		0.173	0.262	NULL	NULL	NULL	10-Oct-13	8-Oct-13
		0.132	0.225	NULL	NULL	NULL	10-Nov-13	8-Nov-13
		0.11	0.24	NULL	NULL	NULL	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		0.136	0.276	NULL	NULL	NULL	10-Jun-14	6-Jun-14
		0.157	0.246	NULL	NULL	NULL	10-Jul-14	10-Jul-14
		0.16	0.26	NULL	NULL	NULL	10-Aug-14	8-Aug-14
		0.131	0.283	NULL	NULL	NULL	10-Sep-14	4-Sep-14
		0.09	0.13	NULL	NULL	NULL	10-Oct-14	8-Oct-14
		0.07	0.14	NULL	NULL	NULL	10-Nov-14	3-Nov-14
		0.05	0.08	NULL	NULL	NULL	10-Dec-14	5-Dec-14
		0.07	0.1	NULL	NULL	NULL	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		0.1	0.143	NULL	NULL	NULL	10-Jun-15	4-Jun-15
		0.111	0.154	NULL	NULL	NULL	10-Jul-15	8-Jul-15
		0.12	0.147	NULL	NULL	NULL	10-Aug-15	4-Aug-15
		0.072	0.122	NULL	NULL	NULL	10-Sep-15	10-Sep-15
		0.094	0.128	NULL	NULL	NULL	10-Oct-15	8-Oct-15
		0.075	0.113	NULL	NULL	NULL	10-Nov-15	2-Nov-15
		0.074	0.114	NULL	NULL	NULL	10-Dec-15	1-Dec-15
pH (S.U.)		NULL	NULL	NULL	7.02	8.97	10-Dec-11	9-Dec-11
		NULL	NULL	NULL	8.25	8.56	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		NULL	NULL	NULL	6.5	8.4	10-Jun-12	8-Jun-12
		NULL	NULL	NULL	6.2	8.9	10-Jul-12	4-Jul-12
		NULL	NULL	NULL	6.7	8.6	10-Aug-12	8-Aug-12
		NULL	NULL	NULL	6.5	8.9	10-Sep-12	7-Sep-12
		NULL	NULL	NULL	6.3	8.55	10-Oct-12	4-Oct-12
		NULL	NULL	NULL	7.04	8.98	10-Nov-12	9-Nov-12
		NULL	NULL	NULL	6.9	8.64	10-Dec-12	10-Dec-12

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		NULL	NULL	6.69	8.88	10-Jul-13	1-Jul-13	
		NULL	NULL	7.13	8.97	10-Aug-13	9-Aug-13	
		NULL	NULL	7.48	8.97	10-Sep-13	9-Sep-13	
		NULL	NULL	6.65	8.61	10-Oct-13	8-Oct-13	
		NULL	NULL	6.93	8.87	10-Nov-13	8-Nov-13	
		NULL	NULL	6.85	8.95	10-Dec-13	10-Dec-13	
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	7.74	8.48	10-Jun-14	6-Jun-14	
		NULL	NULL	6.85	8.82	10-Jul-14	10-Jul-14	
		NULL	NULL	7.9	8.9	10-Aug-14	8-Aug-14	
		NULL	NULL	7.5	8.7	10-Sep-14	4-Sep-14	
		NULL	NULL	6.8	8.8	10-Oct-14	8-Oct-14	
		NULL	NULL	6.6	8.8	10-Nov-14	3-Nov-14	
		NULL	NULL	8.4	8.5	10-Dec-14	5-Dec-14	
		NULL	NULL	7.1	9	10-Jan-15	6-Jan-15	
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		NULL	NULL	7.7	8.7	10-Jun-15	4-Jun-15	
		NULL	NULL	7.2	8.7	10-Jul-15	8-Jul-15	
		NULL	NULL	6.7	8.7	10-Aug-15	4-Aug-15	
		NULL	NULL	7.8	8.9	10-Sep-15	10-Sep-15	
		NULL	NULL	7.3	8.7	10-Oct-15	8-Oct-15	
		NULL	NULL	6.8	8.8	10-Nov-15	2-Nov-15	
		NULL	NULL	6.5	7.9	10-Dec-15	1-Dec-15	
				90th	8.97			
				10th	8.50			
BOD5 (Kg/day)	363	365	NULL	NULL	NULL	10-Dec-11	9-Dec-11	
	121	121	NULL	NULL	NULL	10-Jan-12	5-Jan-12	
	NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12	
	NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12	
	NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12	
	NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12	
	163	201	NULL	NULL	NULL	10-Jun-12	8-Jun-12	
	450	605	NULL	NULL	NULL	10-Jul-12	4-Jul-12	
	396	499	NULL	NULL	NULL	10-Aug-12	8-Aug-12	
	276	367	NULL	NULL	NULL	10-Sep-12	7-Sep-12	
	285	448	NULL	NULL	NULL	10-Oct-12	4-Oct-12	
	271.2	425.4	NULL	NULL	NULL	10-Nov-12	9-Nov-12	
	430.02	689.7	NULL	NULL	NULL	10-Dec-12	10-Dec-12	
	NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13	
	NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13	
	NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13	
	NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13	
	NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13	
	NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13	
	158	187	NULL	NULL	NULL	10-Jul-13	1-Jul-13	
	501	554	NULL	NULL	NULL	10-Aug-13	9-Aug-13	
	468	558	NULL	NULL	NULL	10-Sep-13	9-Sep-13	
	382	608	NULL	NULL	NULL	10-Oct-13	8-Oct-13	
	183	249	NULL	NULL	NULL	10-Nov-13	8-Nov-13	
	246	342	NULL	NULL	NULL	10-Dec-13	10-Dec-13	
	NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14	

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		66	115	NULL	NULL	NULL	10-Jun-14	6-Jun-14
		144	241	NULL	NULL	NULL	10-Jul-14	10-Jul-14
		459	657	NULL	NULL	NULL	10-Aug-14	8-Aug-14
		310	320	NULL	NULL	NULL	10-Sep-14	4-Sep-14
		129	174	NULL	NULL	NULL	10-Oct-14	8-Oct-14
		104	171	NULL	NULL	NULL	10-Nov-14	3-Nov-14
		36	40	NULL	NULL	NULL	10-Dec-14	5-Dec-14
		130	204	NULL	NULL	NULL	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		135	227	NULL	NULL	NULL	10-Jun-15	4-Jun-15
		158	192	NULL	NULL	NULL	10-Jul-15	8-Jul-15
		87	105	NULL	NULL	NULL	10-Aug-15	4-Aug-15
		190	251	NULL	NULL	NULL	10-Sep-15	10-Sep-15
		224	231	NULL	NULL	NULL	10-Oct-15	8-Oct-15
		186	220	NULL	NULL	NULL	10-Nov-15	2-Nov-15
		191	191	NULL	NULL	NULL	10-Dec-15	1-Dec-15
TSS (Kg/day)		9.1	14.7	NULL	NULL	NULL	10-Dec-11	9-Dec-11
		7	7	NULL	NULL	NULL	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		9	16	NULL	NULL	NULL	10-Jun-12	8-Jun-12
		9	10	NULL	NULL	NULL	10-Jul-12	4-Jul-12
		8	10	NULL	NULL	NULL	10-Aug-12	8-Aug-12
		5	5	NULL	NULL	NULL	10-Sep-12	7-Sep-12
		11	13	NULL	NULL	NULL	10-Oct-12	4-Oct-12
		2.4	3.5	NULL	NULL	NULL	10-Nov-12	9-Nov-12
		6.5	10.8	NULL	NULL	NULL	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		5	8	NULL	NULL	NULL	10-Jul-13	1-Jul-13
		6.1	6.5	NULL	NULL	NULL	10-Aug-13	9-Aug-13
		11.4	13.2	NULL	NULL	NULL	10-Sep-13	9-Sep-13
		13.59	21.26	NULL	NULL	NULL	10-Oct-13	8-Oct-13
		4.74	5.39	NULL	NULL	NULL	10-Nov-13	8-Nov-13
		5.88	8.69	NULL	NULL	NULL	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		8.72	13.9	NULL	NULL	NULL	10-Jun-14	6-Jun-14
		16	23	NULL	NULL	NULL	10-Jul-14	10-Jul-14
		17	23	NULL	NULL	NULL	10-Aug-14	8-Aug-14
		26	32	NULL	NULL	NULL	10-Sep-14	4-Sep-14
		11	12	NULL	NULL	NULL	10-Oct-14	8-Oct-14
		8	14.6	NULL	NULL	NULL	10-Nov-14	3-Nov-14
		9	11	NULL	NULL	NULL	10-Dec-14	5-Dec-14
		15	17	NULL	NULL	NULL	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		16	20	NULL	NULL	NULL	10-Jun-15	4-Jun-15
		10	11	NULL	NULL	NULL	10-Jul-15	8-Jul-15
		5	8	NULL	NULL	NULL	10-Aug-15	4-Aug-15
		6	7	NULL	NULL	NULL	10-Sep-15	10-Sep-15
		10	12	NULL	NULL	NULL	10-Oct-15	8-Oct-15
		6	8	NULL	NULL	NULL	10-Nov-15	2-Nov-15
		3	3	NULL	NULL	NULL	10-Dec-15	1-Dec-15
PHOSPHORUS, TOTAL (AS P) (mg/L)								
		0.4	NULL	0.79	NULL	NULL	10-Dec-11	9-Dec-11
		1.0	NULL	.19	NULL	NULL	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		1.2	NULL	1.3	NULL	NULL	10-Jun-12	8-Jun-12
		0.3	NULL	0.4	NULL	NULL	10-Jul-12	4-Jul-12
		0.4	NULL	0.9	NULL	NULL	10-Aug-12	8-Aug-12
		.3	NULL	.8	NULL	NULL	10-Sep-12	7-Sep-12
		.7	NULL	.9	NULL	NULL	10-Oct-12	4-Oct-12
		.37	NULL	.74	NULL	NULL	10-Nov-12	9-Nov-12
		.19	NULL	1.24	NULL	NULL	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		.57	NULL	.18	NULL	NULL	10-Jul-13	1-Jul-13
		.6	NULL	.34	NULL	NULL	10-Aug-13	9-Aug-13
		.32	NULL	.51	NULL	NULL	10-Sep-13	9-Sep-13
		.43	NULL	.72	NULL	NULL	10-Oct-13	8-Oct-13
		.55	NULL	1.12	NULL	NULL	10-Nov-13	8-Nov-13
		.16	NULL	.8	NULL	NULL	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		.16	NULL	.8	NULL	NULL	10-Jun-14	6-Jun-14
		.77	NULL	.74	NULL	NULL	10-Jul-14	10-Jul-14
		.2	NULL	.4	NULL	NULL	10-Aug-14	8-Aug-14
		.5	NULL	.8	NULL	NULL	10-Sep-14	4-Sep-14
		0.3	NULL	1.1	NULL	NULL	10-Oct-14	8-Oct-14
		.14	NULL	.68	NULL	NULL	10-Nov-14	3-Nov-14
		0.2	NULL	1.0	NULL	NULL	10-Dec-14	5-Dec-14
		.2	NULL	.8	NULL	NULL	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		.1	NULL	.3	NULL	NULL	10-Jun-15	4-Jun-15
		0.06	NULL	0.2	NULL	NULL	10-Jul-15	8-Jul-15
		0.1	NULL	0.2	NULL	NULL	10-Aug-15	4-Aug-15
		0.06	NULL	.29	NULL	NULL	10-Sep-15	10-Sep-15
		.09	NULL	0.2	NULL	NULL	10-Oct-15	8-Oct-15
		.03	NULL	.11	NULL	NULL	10-Nov-15	2-Nov-15
		.024	NULL	.130	NULL	NULL	10-Dec-15	1-Dec-15
AMMONIA, AS N (mg/L)								
		NULL	NULL	10.0	NULL	10.8	10-Dec-11	9-Dec-11
		NULL	NULL	14.6	NULL	14.6	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		NULL	NULL	8.1	NULL	11.1	10-Jun-12	8-Jun-12
		NULL	NULL	14.0	NULL	18.7	10-Jul-12	4-Jul-12
		NULL	NULL	12.9	NULL	14.6	10-Aug-12	8-Aug-12
		NULL	NULL	21.4	NULL	21.5	10-Sep-12	7-Sep-12
		NULL	NULL	14.4	NULL	22	10-Oct-12	4-Oct-12
		NULL	NULL	14.4	NULL	17.6	10-Nov-12	9-Nov-12
		NULL	NULL	18.3	NULL	23.0	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		NULL	NULL	11	NULL	12.3	10-Jul-13	1-Jul-13
		NULL	NULL	20.3	NULL	24.2	10-Aug-13	9-Aug-13
		NULL	NULL	22.2	NULL	27.5	10-Sep-13	9-Sep-13
		NULL	NULL	21.8	NULL	36.2	10-Oct-13	8-Oct-13
		NULL	NULL	15.85	NULL	25.5	10-Nov-13	8-Nov-13
		NULL	NULL	16.9	NULL	27.6	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	9.45	NULL	12.6	10-Jun-14	6-Jun-14
		NULL	NULL	12.9	NULL	18.6	10-Jul-14	10-Jul-14
		NULL	NULL	26.0	NULL	30.1	10-Aug-14	8-Aug-14
		NULL	NULL	10.8	NULL	13.7	10-Sep-14	4-Sep-14
		NULL	NULL	27.1	NULL	35	10-Oct-14	8-Oct-14
		NULL	NULL	8.4	NULL	11.5	10-Nov-14	3-Nov-14
		NULL	NULL	19.2	NULL	21.4	10-Dec-14	5-Dec-14
		NULL	NULL	23.7	NULL	23.8	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		NULL	NULL	15.9	NULL	22	10-Jun-15	4-Jun-15
		NULL	NULL	28.9	NULL	34.6	10-Jul-15	8-Jul-15
		NULL	NULL	17.8	NULL	28.6	10-Aug-15	4-Aug-15
		NULL	NULL	17.9	NULL	20.6	10-Sep-15	10-Sep-15
		NULL	NULL	20.0	NULL	21.4	10-Oct-15	8-Oct-15
		NULL	NULL	20.9	NULL	28.9	10-Nov-15	2-Nov-15
		NULL	NULL	19.1	NULL	19.1	10-Dec-15	1-Dec-15
TEMPERATURE, WATER (DEG. C)		NULL	NULL	21.9	NULL	24.1	10-Dec-11	9-Dec-11
		NULL	NULL	18	NULL	22	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		NULL	NULL	25	NULL	30	10-Jun-12	8-Jun-12
		NULL	NULL	29.5	NULL	32.3	10-Jul-12	4-Jul-12
		NULL	NULL	31	NULL	34.4	10-Aug-12	8-Aug-12
		NULL	NULL	30.8	NULL	34	10-Sep-12	7-Sep-12
		NULL	NULL	28.4	NULL	33.7	10-Oct-12	4-Oct-12
		NULL	NULL	27.3	NULL	34.5	10-Nov-12	9-Nov-12
		NULL	NULL	23.7	NULL	39.6	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		NULL	NULL	29.54	NULL	34.9	10-Jul-13	1-Jul-13
		NULL	NULL	32.5	NULL	35	10-Aug-13	9-Aug-13
		NULL	NULL	30.6	NULL	33.8	10-Sep-13	9-Sep-13
		NULL	NULL	27.76	NULL	32	10-Oct-13	8-Oct-13
		NULL	NULL	25.36	NULL	29.7	10-Nov-13	8-Nov-13
		NULL	NULL	22.1	NULL	28	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	27.3	NULL	31	10-Jun-14	6-Jun-14
		NULL	NULL	31.2	NULL	34.5	10-Jul-14	10-Jul-14
		NULL	NULL	31.8	NULL	36.8	10-Aug-14	8-Aug-14
		NULL	NULL	29.1	NULL	30.9	10-Sep-14	4-Sep-14
		NULL	NULL	34	NULL	39	10-Oct-14	8-Oct-14
		NULL	NULL	28.8	NULL	34.2	10-Nov-14	3-Nov-14
		NULL	NULL	28	NULL	30	10-Dec-14	5-Dec-14
		NULL	NULL	22	NULL	27	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		NULL	NULL	30.7	NULL	34.8	10-Jun-15	4-Jun-15
		NULL	NULL	32.9	NULL	38.6	10-Jul-15	8-Jul-15
		NULL	NULL	33.1	NULL	37.2	10-Aug-15	4-Aug-15
		NULL	NULL	36	NULL	38	10-Sep-15	10-Sep-15
		NULL	NULL	31	NULL	37	10-Oct-15	8-Oct-15
		NULL	NULL	29	NULL	32	10-Nov-15	2-Nov-15
		NULL	NULL	29	NULL	30	10-Dec-15	1-Dec-15
			32.92	90th	38.06			
OIL & GREASE (Kg/day)		<QL	<QL	NULL	NULL	NULL	10-Dec-11	9-Dec-11
		<QL	<QL	NULL	NULL	NULL	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		<QL	<QL	NULL	NULL	NULL	10-Jun-12	8-Jun-12
		<QL	<QL	NULL	NULL	NULL	10-Jul-12	4-Jul-12
		<QL	<QL	NULL	NULL	NULL	10-Aug-12	8-Aug-12
		<QL	<QL	NULL	NULL	NULL	10-Sep-12	7-Sep-12
		8.3	8.3	NULL	NULL	NULL	10-Oct-12	4-Oct-12
		<QL	<QL	NULL	NULL	NULL	10-Nov-12	9-Nov-12
		<QL	8.43	NULL	NULL	NULL	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		<QL	<QL	NULL	NULL	NULL	10-Jul-13	1-Jul-13
		<QL	<QL	NULL	NULL	NULL	10-Aug-13	9-Aug-13
		<QL	<QL	NULL	NULL	NULL	10-Sep-13	9-Sep-13
		<QL	<QL	NULL	NULL	NULL	10-Oct-13	8-Oct-13
		<QL	<QL	NULL	NULL	NULL	10-Nov-13	8-Nov-13
		<QL	<QL	NULL	NULL	NULL	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		<QL	<QL	NULL	NULL	NULL	10-May-14	1-May-14
		2.7	2.7	NULL	NULL	NULL	10-Jun-14	6-Jun-14
							10-Jul-14	10-Jul-14

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		<QL	<QL	NULL	NULL	NULL	10-Aug-14	8-Aug-14
		4	4	NULL	NULL	NULL	10-Sep-14	4-Sep-14
		5	5	NULL	NULL	NULL	10-Oct-14	8-Oct-14
		<QL	<QL	NULL	NULL	NULL	10-Nov-14	3-Nov-14
		<QL	<QL	NULL	NULL	NULL	10-Dec-14	5-Dec-14
		.8	.8	NULL	NULL	NULL	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		<QL	<QL	NULL	NULL	NULL	10-Jun-15	4-Jun-15
		<QL	<QL	NULL	NULL	NULL	10-Jul-15	8-Jul-15
		<QL	<QL	NULL	NULL	NULL	10-Aug-15	4-Aug-15
		<QL	<QL	NULL	NULL	NULL	10-Sep-15	10-Sep-15
		<QL	<QL	NULL	NULL	NULL	10-Oct-15	8-Oct-15
		<QL	<QL	NULL	NULL	NULL	10-Nov-15	2-Nov-15
		<QL	<QL	NULL	NULL	NULL	10-Dec-15	1-Dec-15

SALTWATER AND TRANSITION ZONES
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Omega Protein, Inc.
 Receiving Stream: Cockrell Creek, UT

Permit No.: VA0003867

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information			Mixing Information			Effluent Information		
Mean Hardness (as CaCO ₃) =	NA	mg/l	Design Flow (MGD)	0.16		Mean Hardness (as CaCO ₃) =	NA	mg/L
90th % Temperature (Annual) =	28.5	(° C)	Acute WLA multiplier	100		90 % Temperature (Annual) =	32.9	(° C)
90th % Temperature (Winter) =		(° C)	Chronic WLA multiplier	100		90 % Temperature (Winter) =		(° C)
90th % Maximum pH =	8.4		Human health WLA multiplier	100		90 % Maximum pH =	8.97	SU
10th % Maximum pH =	7.6					10 % Maximum pH =	8.5	SU
Tier Designation (1 or 2) =	1					Discharge Flow =	0.16	MGD
Early Life Stages Present Y/N =	Y							
Tidal Zone =	1	(1 = saltwater, 2 = transition zone)						
Mean Salinity =	16	(g/kg)						

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
Acenaphthene	0	--	--	9.9E+02	--	--	9.9E+04	--	--	--	--	--	--	--	--	9.9E+04
Acrolein	0	--	--	9.3E+00	--	--	9.3E+02	--	--	--	--	--	--	--	--	9.3E+02
Acrylonitrile ^c	0	--	--	2.5E+00	--	--	2.5E+02	--	--	--	--	--	--	--	--	2.5E+02
Aldrin ^c	0	1.3E+00	--	5.0E-04	1.3E+02	--	5.0E-02	--	--	--	--	--	--	1.3E+02	--	5.0E-02
Ammonia-N (mg/l) - Annual	0	1.32E+00	1.99E-01	--	1.32E+02	1.99E+01	--	--	--	--	--	--	--	1.32E+02	1.99E+01	--
Ammonia-N (mg/l) - Winter	0	9.70E+00	1.46E+00	--	9.70E+02	1.46E+02	--	--	--	--	--	--	--	9.70E+02	1.46E+02	--
Anthracene	0	--	--	4.0E+04	--	--	4.0E+06	--	--	--	--	--	--	--	--	4.0E+06
Antimony	0	--	--	6.4E+02	--	--	6.4E+04	--	--	--	--	--	--	--	--	6.4E+04
Arsenic	0	6.9E+01	3.6E+01	--	6.9E+03	3.6E+03	--	--	--	--	--	--	--	6.9E+03	3.6E+03	--
Benzene ^c	0	--	--	5.1E+02	--	--	5.1E+04	--	--	--	--	--	--	--	--	5.1E+04
Benzidine ^c	0	--	--	2.0E-03	--	--	2.0E-01	--	--	--	--	--	--	--	--	2.0E-01
Benzo (a) anthracene ^c	0	--	--	1.8E-01	--	--	1.8E+01	--	--	--	--	--	--	--	--	1.8E+01
Benzo (b) fluoranthene ^c	0	--	--	1.8E-01	--	--	1.8E+01	--	--	--	--	--	--	--	--	1.8E+01
Benzo (k) fluoranthene ^c	0	--	--	1.8E-01	--	--	1.8E+01	--	--	--	--	--	--	--	--	1.8E+01
Benzo (a) pyrene ^c	0	--	--	1.8E-01	--	--	1.8E+01	--	--	--	--	--	--	--	--	1.8E+01
Bis2-Chloroethyl Ether ^c	0	--	--	5.3E+00	--	--	5.3E+02	--	--	--	--	--	--	--	--	5.3E+02
Bis2-Chloroisopropyl Ether	0	--	--	6.5E+04	--	--	6.5E+06	--	--	--	--	--	--	--	--	6.5E+06
Bis2-Ethylhexyl Phthalate ^c	0	--	--	2.2E+01	--	--	2.2E+03	--	--	--	--	--	--	--	--	2.2E+03
Bromoform ^c	0	--	--	1.4E+03	--	--	1.4E+05	--	--	--	--	--	--	--	--	1.4E+05
Butylbenzylphthalate	0	--	--	1.9E+03	--	--	1.9E+05	--	--	--	--	--	--	--	--	1.9E+05
Cadmium	0	4.0E+01	8.8E+00	--	4.0E+03	8.8E+02	--	--	--	--	--	--	--	4.0E+03	8.8E+02	--
Carbon Tetrachloride ^c	0	--	--	1.6E+01	--	--	1.6E+03	--	--	--	--	--	--	--	--	1.6E+03
Chlordane ^c	0	9.0E-02	4.0E-03	8.1E-03	9.0E+00	4.0E-01	8.1E-01	--	--	--	--	--	--	9.0E+00	4.0E-01	8.1E-01

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
TRC	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorine Prod. Oxidant	0	1.3E+01	7.5E+00	--	1.3E+03	7.5E+02	--	--	--	--	--	--	--	1.3E+03	7.5E+02	--
Chlorobenzene	0	--	--	1.6E+03	--	--	1.6E+05	--	--	--	--	--	--	--	--	1.6E+05
Chlorodibromomethane ^c	0	--	--	1.3E+02	--	--	1.3E+04	--	--	--	--	--	--	--	--	1.3E+04
Chloroform	0	--	--	1.1E+04	--	--	1.1E+06	--	--	--	--	--	--	--	--	1.1E+06
2-Chloronaphthalene	0	--	--	1.6E+03	--	--	1.6E+05	--	--	--	--	--	--	--	--	1.6E+05
2-Chlorophenol	0	--	--	1.5E+02	--	--	1.5E+04	--	--	--	--	--	--	--	--	1.5E+04
Chlorpyrifos	0	1.1E-02	5.6E-03	--	1.1E+00	5.6E-01	--	--	--	--	--	--	--	1.1E+00	5.6E-01	--
Chromium III	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium VI	0	1.1E+03	5.0E+01	--	1.1E+05	5.0E+03	--	--	--	--	--	--	--	1.1E+05	5.0E+03	--
Chrysene ^c	0	--	--	1.8E-02	--	--	1.8E+00	--	--	--	--	--	--	--	--	1.8E+00
Copper	0	9.3E+00	6.0E+00	--	9.3E+02	6.0E+02	--	--	--	--	--	--	--	9.3E+02	6.0E+02	--
Cyanide, Free	0	1.0E+00	1.0E+00	1.6E+04	1.0E+02	1.0E+02	1.6E+06	--	--	--	--	--	--	1.0E+02	1.0E+02	1.6E+06
DDD ^c	0	--	--	3.1E-03	--	--	3.1E-01	--	--	--	--	--	--	--	--	3.1E-01
DDE ^c	0	--	--	2.2E-03	--	--	2.2E-01	--	--	--	--	--	--	--	--	2.2E-01
DDT ^c	0	1.3E-01	1.0E-03	2.2E-03	1.3E+01	1.0E-01	2.2E-01	--	--	--	--	--	--	1.3E+01	1.0E-01	2.2E-01
Demeton	0	--	1.0E-01	--	--	1.0E+01	--	--	--	--	--	--	--	--	1.0E+01	--
Diazinon	0	8.2E-01	8.2E-01	--	8.2E+01	8.2E+01	--	--	--	--	--	--	--	8.2E+01	8.2E+01	--
Dibenz(a,h)anthracene ^c	0	--	--	1.8E-01	--	--	1.8E+01	--	--	--	--	--	--	--	--	1.8E+01
1,2-Dichlorobenzene	0	--	--	1.3E+03	--	--	1.3E+05	--	--	--	--	--	--	--	--	1.3E+05
1,3-Dichlorobenzene	0	--	--	9.6E+02	--	--	9.6E+04	--	--	--	--	--	--	--	--	9.6E+04
1,4-Dichlorobenzene	0	--	--	1.9E+02	--	--	1.9E+04	--	--	--	--	--	--	--	--	1.9E+04
3,3-Dichlorobenzidine ^c	0	--	--	2.8E-01	--	--	2.8E+01	--	--	--	--	--	--	--	--	2.8E+01
Dichlorobromomethane ^c	0	--	--	1.7E+02	--	--	1.7E+04	--	--	--	--	--	--	--	--	1.7E+04
1,2-Dichloroethane ^c	0	--	--	3.7E+02	--	--	3.7E+04	--	--	--	--	--	--	--	--	3.7E+04
1,1-Dichloroethylene	0	--	--	7.1E+03	--	--	7.1E+05	--	--	--	--	--	--	--	--	7.1E+05
1,2-trans-dichloroethylene	0	--	--	1.0E+04	--	--	1.0E+06	--	--	--	--	--	--	--	--	1.0E+06
2,4-Dichlorophenol	0	--	--	2.9E+02	--	--	2.9E+04	--	--	--	--	--	--	--	--	2.9E+04
1,2-Dichloropropane ^c	0	--	--	1.5E+02	--	--	1.5E+04	--	--	--	--	--	--	--	--	1.5E+04
1,3-Dichloropropene ^c	0	--	--	2.1E+02	--	--	2.1E+04	--	--	--	--	--	--	--	--	2.1E+04
Dieldrin ^c	0	7.1E-01	1.9E-03	5.4E-04	7.1E+01	1.9E-01	5.4E-02	--	--	--	--	--	--	7.1E+01	1.9E-01	5.4E-02
Diethyl Phthalate	0	--	--	4.4E+04	--	--	4.4E+06	--	--	--	--	--	--	--	--	4.4E+06
2,4-Dimethylphenol	0	--	--	8.5E+02	--	--	8.5E+04	--	--	--	--	--	--	--	--	8.5E+04
Dimethyl Phthalate	0	--	--	1.1E+06	--	--	1.1E+08	--	--	--	--	--	--	--	--	1.1E+08
Di-n-Butyl Phthalate	0	--	--	4.5E+03	--	--	4.5E+05	--	--	--	--	--	--	--	--	4.5E+05
2,4 Dinitrophenol	0	--	--	5.3E+03	--	--	5.3E+05	--	--	--	--	--	--	--	--	5.3E+05
2-Methyl-4,6-Dinitrophenol	0	--	--	2.8E+02	--	--	2.8E+04	--	--	--	--	--	--	--	--	2.8E+04
2,4-Dinitrotoluene ^c	0	--	--	3.4E+01	--	--	3.4E+03	--	--	--	--	--	--	--	--	3.4E+03
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	5.1E-08	--	--	5.1E-06	--	--	--	--	--	--	--	--	5.1E-06
1,2-Diphenylhydrazine ^c	0	--	--	2.0E+00	--	--	2.0E+02	--	--	--	--	--	--	--	--	2.0E+02
Alpha-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	3.4E+00	8.7E-01	8.9E+03	--	--	--	--	--	--	3.4E+00	8.7E-01	8.9E+03

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
Beta-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	3.4E+00	8.7E-01	8.9E+03	--	--	--	--	--	--	3.4E+00	8.7E-01	8.9E+03
Alpha + Beta Endosulfan	0	3.4E-02	8.7E-03	--	3.4E+00	8.7E-01	--	--	--	--	--	--	--	3.4E+00	8.7E-01	--
Endosulfan Sulfate	0	--	--	8.9E+01	--	--	8.9E+03	--	--	--	--	--	--	--	--	8.9E+03
Endrin	0	3.7E-02	2.3E-03	6.0E-02	3.7E+00	2.3E-01	6.0E+00	--	--	--	--	--	--	3.7E+00	2.3E-01	6.0E+00
Endrin Aldehyde	0	--	--	3.0E-01	--	--	3.0E+01	--	--	--	--	--	--	--	--	3.0E+01
Ethylbenzene	0	--	--	2.1E+03	--	--	2.1E+05	--	--	--	--	--	--	--	--	2.1E+05
Fluoranthene	0	--	--	1.4E+02	--	--	1.4E+04	--	--	--	--	--	--	--	--	1.4E+04
Fluorene	0	--	--	5.3E+03	--	--	5.3E+05	--	--	--	--	--	--	--	--	5.3E+05
Guthion	0	--	1.0E-02	--	--	1.0E+00	--	--	--	--	--	--	--	--	1.0E+00	--
Heptachlor ^c	0	5.3E-02	3.6E-03	7.9E-04	5.3E+00	3.6E-01	7.9E-02	--	--	--	--	--	--	5.3E+00	3.6E-01	7.9E-02
Heptachlor Epoxide ^c	0	5.3E-02	3.6E-03	3.9E-04	5.3E+00	3.6E-01	3.9E-02	--	--	--	--	--	--	5.3E+00	3.6E-01	3.9E-02
Hexachlorobenzene ^c	0	--	--	2.9E-03	--	--	2.9E-01	--	--	--	--	--	--	--	--	2.9E-01
Hexachlorobutadiene ^c	0	--	--	1.8E+02	--	--	1.8E+04	--	--	--	--	--	--	--	--	1.8E+04
Hexachlorocyclohexane Alpha-BHC ^c	0	--	--	4.9E-02	--	--	4.9E+00	--	--	--	--	--	--	--	--	4.9E+00
Hexachlorocyclohexane Beta-BHC ^c	0	--	--	1.7E-01	--	--	1.7E+01	--	--	--	--	--	--	--	--	1.7E+01
Hexachlorocyclohexane Gamma-BHC ^c (Lindane)	0	1.6E-01	--	1.8E+00	1.6E+01	--	1.8E+02	--	--	--	--	--	--	1.6E+01	--	1.8E+02
Hexachlorocyclopentadiene	0	--	--	1.1E+03	--	--	1.1E+05	--	--	--	--	--	--	--	--	1.1E+05
Hexachloroethane ^c	0	--	--	3.3E+01	--	--	3.3E+03	--	--	--	--	--	--	--	--	3.3E+03
Hydrogen Sulfide	0	--	2.0E+00	--	--	2.0E+02	--	--	--	--	--	--	--	--	2.0E+02	--
Indeno (1,2,3-cd) pyrene C	0	--	--	1.8E-01	--	--	1.8E+01	--	--	--	--	--	--	--	--	1.8E+01
Isophorone ^c	0	--	--	9.6E+03	--	--	9.6E+05	--	--	--	--	--	--	--	--	9.6E+05
Kepone	0	--	0.0E+00	--	--	0.0E+00	--	--	--	--	--	--	--	--	0.0E+00	--
Lead	0	2.4E+02	9.3E+00	--	2.4E+04	9.3E+02	--	--	--	--	--	--	--	2.4E+04	9.3E+02	--
Malathion	0	--	1.0E-01	--	--	1.0E+01	--	--	--	--	--	--	--	--	1.0E+01	--
Mercury	0	1.8E+00	9.4E-01	--	1.8E+02	9.4E+01	--	--	--	--	--	--	--	1.8E+02	9.4E+01	--
Methyl Bromide	0	--	--	1.5E+03	--	--	1.5E+05	--	--	--	--	--	--	--	--	1.5E+05
Methylene Chloride ^c	0	--	--	5.9E+03	--	--	5.9E+05	--	--	--	--	--	--	--	--	5.9E+05
Methoxychlor	0	--	3.0E-02	--	--	3.0E+00	--	--	--	--	--	--	--	--	3.0E+00	--
Mirex	0	--	0.0E+00	--	--	0.0E+00	--	--	--	--	--	--	--	--	0.0E+00	--
Nickel	0	7.4E+01	8.2E+00	4.6E+03	7.4E+03	8.2E+02	4.6E+05	--	--	--	--	--	--	7.4E+03	8.2E+02	4.6E+05
Nitrobenzene	0	--	--	6.9E+02	--	--	6.9E+04	--	--	--	--	--	--	--	--	6.9E+04
N-Nitrosodimethylamine ^c	0	--	--	3.0E+01	--	--	3.0E+03	--	--	--	--	--	--	--	--	3.0E+03
N-Nitrosodiphenylamine ^c	0	--	--	6.0E+01	--	--	6.0E+03	--	--	--	--	--	--	--	--	6.0E+03
N-Nitrosodi-n-propylamine ^c	0	--	--	5.1E+00	--	--	5.1E+02	--	--	--	--	--	--	--	--	5.1E+02
Nonylphenol	0	7.0E+00	1.7E+00	--	7.0E+02	1.7E+02	--	--	--	--	--	--	--	7.0E+02	1.7E+02	--
Parathion	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB Total ^c	0	--	3.0E-02	6.4E-04	--	3.0E+00	6.4E-02	--	--	--	--	--	--	--	3.0E+00	6.4E-02
Pentachlorophenol ^c	0	1.3E+01	7.9E+00	3.0E+01	1.3E+03	7.9E+02	3.0E+03	--	--	--	--	--	--	1.3E+03	7.9E+02	3.0E+03

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
Phenol	0	--	--	8.6E+05	--	--	8.6E+07	--	--	--	--	--	--	--	--	8.6E+07
Phosphorus (Elemental)	0	--	1.0E-01	--	--	1.0E+01	--	--	--	--	--	--	--	--	1.0E+01	--
Pyrene	0	--	--	4.0E+03	--	--	4.0E+05	--	--	--	--	--	--	--	--	4.0E+05
Selenium	0	2.9E+02	7.1E+01	4.2E+03	2.9E+04	7.1E+03	4.2E+05	--	--	--	--	--	--	2.9E+04	7.1E+03	4.2E+05
Silver	0	1.9E+00	--	--	1.9E+02	--	--	--	--	--	--	--	--	1.9E+02	--	--
1,1,2,2-Tetrachloroethane ^C	0	--	--	4.0E+01	--	--	4.0E+03	--	--	--	--	--	--	--	--	4.0E+03
Tetrachloroethylene ^C	0	--	--	3.3E+01	--	--	3.3E+03	--	--	--	--	--	--	--	--	3.3E+03
Thallium	0	--	--	4.7E-01	--	--	4.7E+01	--	--	--	--	--	--	--	--	4.7E+01
Toluene	0	--	--	6.0E+03	--	--	6.0E+05	--	--	--	--	--	--	--	--	6.0E+05
Toxaphene ^C	0	2.1E-01	2.0E-04	2.8E-03	2.1E+01	2.0E-02	2.8E-01	--	--	--	--	--	--	2.1E+01	2.0E-02	2.8E-01
Tributyltin	0	4.2E-01	7.4E-03	--	4.2E+01	7.4E-01	--	--	--	--	--	--	--	4.2E+01	7.4E-01	--
1,2,4-Trichlorobenzene	0	--	--	7.0E+01	--	--	7.0E+03	--	--	--	--	--	--	--	--	7.0E+03
1,1,2-Trichloroethane ^C	0	--	--	1.6E+02	--	--	1.6E+04	--	--	--	--	--	--	--	--	1.6E+04
Trichloroethylene ^C	0	--	--	3.0E+02	--	--	3.0E+04	--	--	--	--	--	--	--	--	3.0E+04
2,4,6-Trichlorophenol ^C	0	--	--	2.4E+01	--	--	2.4E+03	--	--	--	--	--	--	--	--	2.4E+03
Vinyl Chloride ^C	0	--	--	2.4E+01	--	--	2.4E+03	--	--	--	--	--	--	--	--	2.4E+03
Zinc	0	9.0E+01	8.1E+01	2.6E+04	9.0E+03	8.1E+03	2.6E+06	--	--	--	--	--	--	9.0E+03	8.1E+03	2.6E+06

Notes:

- All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
- Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipalities
- Metals measured as Dissolved, unless specified otherwise
- "C" indicates a carcinogenic parameter
- For transition zone waters, spreadsheet prints the lesser of the freshwater and saltwater water quality criteria.
- Regular WLA = (WQC x WLA multiplier) - (WLA multiplier - 1)(background conc.)
- Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
= (0.1(WQC - background conc.) + background conc.) for human health
- Antideg. WLA = (Antideg. Baseline)(WLA multiplier) - (WLA multiplier - 1)(background conc.)

Site Specific Target Value (SSTV)	
Metal	Target Value (SSTV)
Antimony	6.4E+04
Arsenic III	2.2E+03
Cadmium	5.3E+02
Chromium III	#VALUE!
Chromium VI	3.0E+03
Copper	3.6E+02
Lead	5.6E+02
Mercury	5.6E+01
Nickel	4.9E+02
Selenium	4.3E+03
Silver	7.6E+01
Zinc	3.6E+03

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Outfall 002 STATS.EXE Limitation Evaluation

Chemical = **Ammonia**

Chronic averaging period = 30

WLAa = 132 mg/L

WLAc = 19.9 mg/L

Q.L. = 0.2 mg/L

samples/mo. = 2

samples/wk. = 1

Summary of Statistics:

observations = 1

Expected Value = 250

Variance = 22500

C.V. = 0.6

97th percentile daily values = 608.354

97th percentile 4 day average = 415.947

97th percentile 30 day average= 301.513

< Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 40.1516348589846

Average Weekly limit = 40.1516348589846

Average Monthly Llimit = 32.6506665763086

The data are:

250 mg/L

In accordance with GM00-2011, if the facility already has an ammonia limitation, then effluent data that was obtained to demonstrate compliance with that limitation cannot be used to determine if a reasonable potential to cause or contribute to a violation of the standards exists. In these cases, a high fictitious data point (rather than the actual data) should be used to force the program to calculate a limit. The resulting limit can be compared to the existing limit to determine if it is sufficiently stringent. The limitations obtained above are the same as the ones in the 2011 permit, and therefore they are carried forward to the 2016 permit.

Chemical = **Cyanide (µg/L)**

Chronic averaging period = 4

WLAa = 100

WLAc = 100

Q.L. = 10

samples/mo. = 1

samples/wk. = 1

Summary of Statistics:

observations = 1

Expected Value = 23

Variance = 190.44

C.V. = 0.6

97th percentile daily values = 55.9686

97th percentile 4 day average = 38.2671

97th percentile 30 day average= 27.7392

< Q.L. = 0

Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

23

ATTACHMENT I

Whole Effluent Toxicity Testing Evaluation – Outfall 002



DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296

804/527-5020

MEMORANDUM

To: Deborah DeBiasi, CO WET Coordinator
From: Laura Galli, PRO VPDES Permit Writer
Subject: Whole Effluent Toxicity (WET) Test Data Review – Outfall 002
VPDES Permit VA0003867 – Omega Protein, Inc.
Date: January 21, 2016

Background

The permit for the Omega Proteins plant located at 610 Menhaden Road, in Reedville, Virginia is in the process of reissuance. The facility processes menhaden by cooking the fish, pressing and separating the oil and solids, and evaporating the water to leave fish meal and oil. Wastewater associated with this type of fish processing includes Evaporator and Dryer Condensate, boiler blowdown, and non-contact cooling water. The current permit, issued June 10, 2011 requires Whole Effluent Toxicity (WET) testing on Outfall 002. Evaporator condensate is generated as wastewater as the plant processes fish. The condensate is treated through ammonia strippers and discharged from Outfall 002. Also, discharged from Outfall 002 is a small amount of boiler blowdown created from the operation of cookers and steam dryers. The discharge from Outfall 002 has a WET limit of 14 acute toxic units (14 TU_a equivalent to an LC₅₀ of 7) in Part I.A.1 of the 2011 permit based on previous demonstrations of potential toxicity from the discharge. The permit requires that 24-hour flow proportioned composite samples be collected quarterly and specifies that the 48 hour static acute tests using *Mysidopsis bahia* (now known as *Americamysis bahia*) be performed. All toxicity tests were performed by Coastal Bioanalysts, Inc. No monitoring was required during quarters when no discharge occurred.

Outfall 995 consists of the discharge of non-contact cooling water; since the discharge from this outfall is not believed to be a potential source of toxicity, no WET monitoring was required.

Data Summary

WET tests results from quarterly monitoring conducted from 2011 to 2015 at Outfall 002 are shown in Table 1 below. All tests were performed in accordance with approved testing techniques. Acute toxicity test results show compliance with acute toxicity limitation contained in the 2011 permit. Quarter 3 of 2012 did not meet the WET limitation; however, a verification sample was collected and no toxicity was recorded.

Table 1: Quarterly *M. bahia* Acute WET Test Results for Outfall 002

Year	Quarter	Date of Test	LC50	TU _a
2011	1	10/12/2011	>100	<1.00
	2	No sample collected		
2012	1	No sample collected		
	2	07/17/2012	32.6	3.07
	3	10/11/2012 Re-sampled 10/18/2012	4.5	22.22
		>100	<1.00	
2013	4	11/13/2012	35.7	2.8
	1	No sample collected		
	2	06/19/2013	52.9	1.89
	3	10/08/2013	>100	<1.00
2014	4	11/11/2013	78.8	1.27
	1	No sample collected		
	2	06/05/2014	65.4	1.53
	3	10/21/2014	52.9	1.89
2015	4	No sample collected		
	1	05/13/2015	52.9	1.89
	2	06/17/2015	52.9	1.89
	3	10/22/2015	17.5	5.71
	4	11/05/2015	9.9	10.1

Discussion and Data Evaluation

The toxicity data was analyzed using the agency established WETLIM10.xls spreadsheet and the STATS.exe statistical software to determine if there is a need to adjust the acute and chronic endpoints or establish permit limitations for toxicity. For Outfall 002, an acute and chronic dilution ratio of 1:100 are applied based on the 1998 CORMIX analysis and modeling results (See Attachment E). Note that when "Y" is entered for "Diffuser/Model Study?" the plant and receiving stream flow information is not used in the endpoint and limitation evaluation. The plant flow is being included for informational purposes only and was obtained from the application Form 2C. Based on results from the WETLIM10 evaluation, the acute instream waste concentration is calculated as 1 %. An acute toxicity limitation of 14 TU_a is appropriate for Outfall 002. Using the wasteload allocations calculated in WETLIM10 and the acute toxicity data reported in toxic units (TU) as shown in the table above, the STATS.exe statistical software program was used to determine if a more stringent toxicity limitation may be required for Outfall 002.

STATS.EXE Output

Chemical = WET - TU_a Outfall 002

Chronic averaging period = 4

WL_{Aa} = 30

WL_{Ac} =

Q.L. = 1

samples/mo. = 1

samples/wk. = 1

Summary of Statistics:

observations = 15

Expected Value = 3.50241

Variance = 16.0877

C.V. = 1.145196

97th percentile daily values = 12.8880

97th percentile 4 day average = 8.27575

97th percentile 30 day average= 4.87986

< Q.L. = 0

Model used = lognormal

No Limit is required for this material

The data are:

10.1 1.89

5.71 3.07

1.89 22.22

1.89 1

1.89 1

1.53 1

1.27 1

2.8

Statistical evaluation resulted in no recommended limitation on the basis of acute toxicity. However, the permit will retain the limitation of 14 TU_a in accordance with the agency anti-back sliding policy.

Recommendations

In accordance with Guidance Memo No. 00-2012, data evaluation, and permit writer judgment, below is the recommended language for whole effluent toxicity limitation for the 2016 permit:

Whole Effluent Toxicity (WET) Limitation and Monitoring Requirements

1. The Whole Effluent Toxicity limitation of 14 TU_a (LC₅₀ ≥ 7%) in part I.A.1 is a final limit upon issuance of this permit.
2. Commencing within the first complete quarter after the effective date of this permit, the permittee shall conduct quarterly 48-Hour Static Acute Tests using *Americamysis bahia* (previously known as *Mysidopsis bahia*) using 24-hour flow-proportioned composite samples of final effluent from outfall 002.

These acute tests are to be conducted using 5 geometric dilutions of effluent with a minimum of 4 replicates, with 5 organisms in each. Tests in which control survival is less than 90% are not acceptable.

One copy of the detailed report concerning the conduct of the test shall accompany the DMR on which the results are reported. Technical assistance in developing the procedures for these tests shall be provided by the DEQ, if requested by the permittee. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3.

3. The test dilutions should be able to determine compliance with the following endpoints:
 LC_{50} of $\geq 7\%$ equivalent to a TU_a of ≤ 14
4. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters.
5. The monitoring quarters shall be defined by the seasonal operations of the facility as follows:

Quarter 1: January 1st – March 30th
Quarter 2: April 1st – June 30th
Quarter 3: July 1st – September 30th
Quarter 4: October 1st – December 31st

6. The permittee shall report the results on the quarterly DMR and submit a copy of each toxicity test report in accordance with the following schedule:

Test Period	Test Period Dates	DMR/Report Due Date
Quarter 1	January 1 – March 31, 2017	April 10, 2017
Quarter 2	April 1 – June 30, 2017	July 10, 2017
Quarter 3	July 1 – September 30, 2017	October 10, 2017
Quarter 4	October 1 – December 31, 2017	January 10, 2018
Quarter 5	January 1 – March 31, 2018	April 10, 2018
Quarter 6	April 1 – June 30, 2018	July 10, 2018
Quarter 7	July 1 – September 30, 2018	October 10, 2018
Quarter 8	October 1 – December 31, 2018	January 10, 2019
Quarter 9	January 1 – March 31, 2019	April 10, 2019
Quarter 10	April 1 – June 30, 2019	July 10, 2019
Quarter 11	July 1 – September 30, 2019	October 10, 2019
Quarter 12	October 1 – December 31, 2019	January 10, 2020
Quarter 13	January 1 – March 31, 2020	April 10, 2020
Quarter 14	April 1 – June 30, 2020	July 10, 2020
Quarter 15	July 1 – September 30, 2020	October 10, 2020
Quarter 16	October 1 – December 31, 2020	January 10, 2021
Quarter 17	January 1 – March 31, 2021	April 10, 2021
Quarter 18	April 1 – June 30, 2021	July 10, 2021
Quarter 19	July 1 – September 30, 2021	October 10, 2021

7. In the event that quarterly WET testing as required by Part I.A.1 of this permit is not possible due to lack of operations at the facility, the permittee shall submit a written notice to the DEQ Piedmont Regional Office with the DMR submitted for the month following the quarter in which the test was to have been performed.

Spreadsheet for determination of WET test endpoints or WET limits

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
59														
60														
61														
62														
63														
64														
65														
66														
67														
68														
69														
70														
71														
72														
73														
74														
75														
76														
77														
78														
79														
80														
81														
82														
83														
84														
85														
86														
87														
88														
89														
90														
91														
92														
93														
94														
95														
96														
97														
98														
99														
100														
101														
102														
103														
104														
105														
106														
107														
108														
109														

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">")

FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN

"J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS

BELOW. THE DEFAULT VALUES FOR eA,

eB, AND eC WILL CHANGE IF THE 'CV' IS

ANYTHING OTHER THAN 0.6.

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)													
To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC ₅₀ , since the ACR divides the LC ₅₀ by the NOEC. LC ₅₀ 's >100% should not be used.													
Table 1. ACR using Vertebrate data							Convert LC₅₀'s and NOEC's to Chronic TU's for use in WLA.EXE						
							Table 3. ACR used: 10						
Set #	LC₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use	Enter LC₅₀	TUc	Enter NOEC	TUc		
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	1	NO DATA	NO DATA	NO DATA		
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	2	NO DATA	NO DATA	NO DATA		
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	3	NO DATA	NO DATA	NO DATA		
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	4	NO DATA	NO DATA	NO DATA		
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	5	NO DATA	NO DATA	NO DATA		
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	6	NO DATA	NO DATA	NO DATA		
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	7	NO DATA	NO DATA	NO DATA		
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	8	NO DATA	NO DATA	NO DATA		
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	9	NO DATA	NO DATA	NO DATA		
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	10	NO DATA	NO DATA	NO DATA		
ACR for vertebrate data:							0	11	NO DATA	NO DATA	NO DATA	NO DATA	
								12	NO DATA	NO DATA	NO DATA	NO DATA	
Table 1. Result: Vertebrate ACR							0	13	NO DATA	NO DATA	NO DATA	NO DATA	
Table 2. Result: Invertebrate ACR							0	14	NO DATA	NO DATA	NO DATA	NO DATA	
Table 2. Result: Lowest ACR							Default to 10	15	NO DATA	NO DATA	NO DATA	NO DATA	
								16	NO DATA	NO DATA	NO DATA	NO DATA	
Table 2. ACR using Invertebrate data								17	NO DATA	NO DATA	NO DATA	NO DATA	
								18	NO DATA	NO DATA	NO DATA	NO DATA	
Set #	LC₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use	20	NO DATA	NO DATA	NO DATA	NO DATA	
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
ACR for vertebrate data:							0						
DILUTION SERIES TO RECOMMEND													
Table 4.							Monitoring		Limit				
							% Effluent	TUc	% Effluent	TUc			
Dilution series based on data mean							1.6	64.036887					
Dilution series to use for limit								1	100				
Dilution factor to recommend:							0.124964		0.1				
Dilution series to recommend:							100.0	1.00	100.0	1.00			
								12.5	8.00	10.0	10.00		
								1.6	64.04	1.0	100.00		
								0.2	512.44	0.1	1000.00		
								0.02	4100.72	0.0	10000.00		
Extra dilutions if needed							0.00	32815.24	0.0	100000.00			
								0.00	262597.53	0.0	#####		

Cell: I9

Comment:

This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18

Comment:

This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22

Comment:

Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40

Comment:

If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41

Comment:

If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48

Comment:

See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62

Comment:

Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62

Comment:

Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117

Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119

Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121

Comment:

If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138

Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Spreadsheet for determination of WET test endpoints or WET limits

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
59														
60														
61														
62														
63														
64														
65														
66														
67														
68														
69														
70														
71														
72														
73														
74														
75														
76														
77														
78														
79														
80														
81														
82														
83														
84														
85														
86														
87														
88														
89														
90														
91														
92														
93														
94														
95														
96														
97														
98														
99														
100														
101														
102														
103														
104														
105														
106														
107														
108														
109														

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Vertebrate Invertebrate

IC₂₅ Data IC₂₅ Data

or or

LC₅₀ Data LC₅₀ Data

LN of data LN of data

***** *****

1 1 9.9 2.292535

2 2 17.5 2.862201

3 3 52.9 3.968403

4 4 52.9 3.968403

5 5 52.9 3.968403

6 6 65.4 4.180522

7 7 78.8 4.366913

8 8 52.9 3.968403

9 9 35.7 3.575151

10 10 4.5 1.504077

11 11 32.6 3.484312

12 12 52.9 3.968403

13 13 13 13

14 14 14 14

15 15 15 15

16 16 16 16

17 17 17 17

18 18 18 18

19 19 19 19

20 20 20 20

Using the log variance to develop eB

(P. 100, step 2a of TSD)

St Dev NEED DATA NEED DATA St Dev 22.681208 0.8615552

Mean 0 0 Mean 42.408333 3.5089773

Variance 0 0.000000 Variance 514.4372 0.742277

CV 0 CV 1.0491492

Using the log variance to develop eC

(P. 100, step 4a of TSD)

St Dev NEED DATA NEED DATA St Dev 22.681208 0.8615552

Mean 0 0 Mean 42.408333 3.5089773

Variance 0 0.000000 Variance 514.4372 0.742277

CV 0 CV 1.0491492

CV 0 CV 1.0491492

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n² = 0.742277347

δ_n = 0.861555191

D = 1.249446641

eD = 3.488412077

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)													
To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC ₅₀ , since the ACR divides the LC ₅₀ by the NOEC. LC ₅₀ 's >100% should not be used.													
Table 1. ACR using Vertebrate data							Convert LC₅₀'s and NOEC's to Chronic TU's for use in WLA.EXE						
							Table 3. ACR used: 10						
Set #	LC₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use	Enter LC₅₀	TUc	Enter NOEC	TUc		
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	1	NO DATA	NO DATA	NO DATA		
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	2	NO DATA	NO DATA	NO DATA		
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	3	NO DATA	NO DATA	NO DATA		
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	4	NO DATA	NO DATA	NO DATA		
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	5	NO DATA	NO DATA	NO DATA		
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	6	NO DATA	NO DATA	NO DATA		
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	7	NO DATA	NO DATA	NO DATA		
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	8	NO DATA	NO DATA	NO DATA		
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	9	NO DATA	NO DATA	NO DATA		
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA	10	NO DATA	NO DATA	NO DATA		
ACR for vertebrate data:							0	11	NO DATA	NO DATA	NO DATA	NO DATA	
								12	NO DATA	NO DATA	NO DATA	NO DATA	
Table 1. Result: Vertebrate ACR							0	13	NO DATA	NO DATA	NO DATA	NO DATA	
Table 2. Result: Invertebrate ACR							0	14	NO DATA	NO DATA	NO DATA	NO DATA	
Table 2. Result: Lowest ACR							Default to 10	15	NO DATA	NO DATA	NO DATA	NO DATA	
								16	NO DATA	NO DATA	NO DATA	NO DATA	
Table 2. ACR using Invertebrate data								17	NO DATA	NO DATA	NO DATA	NO DATA	
								18	NO DATA	NO DATA	NO DATA	NO DATA	
Set #	LC₅₀	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use	20	NO DATA	NO DATA	NO DATA	NO DATA	
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA						
ACR for vertebrate data:							0						
DILUTION SERIES TO RECOMMEND													
Table 4.							Monitoring		Limit				
							% Effluent	TUc	% Effluent	TUc			
Dilution series based on data mean							1.6	64.036887					
Dilution series to use for limit								1	100				
Dilution factor to recommend:							0.124964		0.1				
Dilution series to recommend:							100.0	1.00	100.0	1.00			
								12.5	8.00	10.0	10.00		
								1.6	64.04	1.0	100.00		
								0.2	512.44	0.1	1000.00		
								0.02	4100.72	0.0	10000.00		
Extra dilutions if needed							0.00	32815.24	0.0	100000.00			
								0.00	262597.53	0.0	#####		

Cell: I9

Comment:

This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18

Comment:

This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22

Comment:

Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40

Comment:

If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41

Comment:

If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48

Comment:

See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62

Comment:

Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62

Comment:

Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117

Comment:

Vertebrates are:
Pimephales promelas
Cyprinodon variegatus

Cell: M119

Comment:

The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121

Comment:

If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: $100/\text{NOEC} = \text{TUc}$ or $100/\text{LC50} = \text{TUa}$.

Cell: C138

Comment:

Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

ATTACHMENT J

Effluent Limitation Development – Outfall 995

Facility Name: Omega Protein, Inc.

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
995	FLOW (MGD)	4.9	8.4	NULL	NULL	NULL	10-Dec-11	9-Dec-11
		3.8	7.0	NULL	NULL	NULL	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		4.8	8.4	NULL	NULL	NULL	10-Jun-12	8-Jun-12
		5.5	8.4	NULL	NULL	NULL	10-Jul-12	4-Jul-12
		6.3	8.4	NULL	NULL	NULL	10-Aug-12	8-Aug-12
		6.2	8.4	NULL	NULL	NULL	10-Sep-12	7-Sep-12
		5.3	8.4	NULL	NULL	NULL	10-Oct-12	4-Oct-12
		4.85	8.42	NULL	NULL	NULL	10-Nov-12	9-Nov-12
		2.46	3.16	NULL	NULL	NULL	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		5.107	8.424	NULL	NULL	NULL	10-Jul-13	1-Jul-13
		4.95	7.90	NULL	NULL	NULL	10-Aug-13	9-Aug-13
		6.4	8.4	NULL	NULL	NULL	10-Sep-13	9-Sep-13
		6.22	9.48	NULL	NULL	NULL	10-Oct-13	8-Oct-13
		5.4	11.6	NULL	NULL	NULL	10-Nov-13	8-Nov-13
		4.70	8.42	NULL	NULL	NULL	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		4.27	6.84	NULL	NULL	NULL	10-Jun-14	6-Jun-14
		5.9	8.4	NULL	NULL	NULL	10-Jul-14	10-Jul-14
		6.0	8.4	NULL	NULL	NULL	10-Aug-14	8-Aug-14
		6.02	8.42	NULL	NULL	NULL	10-Sep-14	4-Sep-14
		5.4	8.4	NULL	NULL	NULL	10-Oct-14	8-Oct-14
		4.8	8.4	NULL	NULL	NULL	10-Nov-14	3-Nov-14
		3.2	4.2	NULL	NULL	NULL	10-Dec-14	5-Dec-14
		4.3	5.8	NULL	NULL	NULL	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		5.54	8.42	NULL	NULL	NULL	10-Jun-15	4-Jun-15
		6.460	8.424	NULL	NULL	NULL	10-Jul-15	8-Jul-15
		6.821	8.424	NULL	NULL	NULL	10-Aug-15	4-Aug-15
		2.446	4.212	NULL	NULL	NULL	10-Sep-15	10-Sep-15
		3.182	4.212	NULL	NULL	NULL	10-Oct-15	8-Oct-15
		2.728	4.212	NULL	NULL	NULL	10-Nov-15	2-Nov-15
		2.523	4.212	NULL	NULL	NULL	10-Dec-15	1-Dec-15
pH (S.U.)		NULL	NULL	NULL	7.87	8.31	10-Dec-11	9-Dec-11
		NULL	NULL	NULL	8.17	8.49	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		NULL	NULL	NULL	7.91	8.3	10-Jun-12	8-Jun-12
		NULL	NULL	NULL	7.8	8.3	10-Jul-12	4-Jul-12
		NULL	NULL	NULL	7.5	8.4	10-Aug-12	8-Aug-12
		NULL	NULL	NULL	7.5	7.9	10-Sep-12	7-Sep-12
		NULL	NULL	NULL	7.5	7.97	10-Oct-12	4-Oct-12
		NULL	NULL	NULL	7.74	8.22	10-Nov-12	9-Nov-12
		NULL	NULL	NULL	7.53	8.43	10-Dec-12	10-Dec-12

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		NULL	NULL	7.66	8.1	10-Jul-13	1-Jul-13	
		NULL	NULL	7.65	8.11	10-Aug-13	9-Aug-13	
		NULL	NULL	7.54	8.14	10-Sep-13	9-Sep-13	
		NULL	NULL	7.53	7.9	10-Oct-13	8-Oct-13	
		NULL	NULL	7.56	8	10-Nov-13	8-Nov-13	
		NULL	NULL	7.78	8.14	10-Dec-13	10-Dec-13	
		NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14	
		NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14	
		NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14	
		NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14	
		NULL	NULL	NULL	NULL	10-May-14	1-May-14	
		NULL	NULL	8.02	8.71	10-Jun-14	6-Jun-14	
		NULL	NULL	7.79	8.25	10-Jul-14	10-Jul-14	
		NULL	NULL	7.7	8.2	10-Aug-14	8-Aug-14	
		NULL	NULL	7.63	8.1	10-Sep-14	4-Sep-14	
		NULL	NULL	7.6	8	10-Oct-14	8-Oct-14	
		NULL	NULL	7.8	8	10-Nov-14	3-Nov-14	
		NULL	NULL	8.4	8.5	10-Dec-14	5-Dec-14	
		NULL	NULL	7.9	8.3	10-Jan-15	6-Jan-15	
		NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15	
		NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15	
		NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15	
		NULL	NULL	NULL	NULL	10-May-15	5-May-15	
		NULL	NULL	7.84	8.12	10-Jun-15	4-Jun-15	
		NULL	NULL	7.5	8	10-Jul-15	8-Jul-15	
		NULL	NULL	7.8	8.4	10-Aug-15	4-Aug-15	
		NULL	NULL	7.9	8.2	10-Sep-15	10-Sep-15	
		NULL	NULL	7.7	8	10-Oct-15	8-Oct-15	
		NULL	NULL	7.9	8	10-Nov-15	2-Nov-15	
		NULL	NULL	7.8	7.9	10-Dec-15	1-Dec-15	
			90th		8.44			
			10th		7.96			

**COPPER, TOTAL
(AS CU) (µg/L)**

NULL	NULL	NR	NULL	NR	10-Jan-12	5-Jan-12
NULL	NULL	<QL	NULL	<QL	10-Feb-12	21-Nov-11
NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
NULL	NULL	NR	NULL	NR	10-Jun-12	8-Jun-12
NULL	NULL	NR	NULL	NR	10-Jul-12	4-Jul-12
NULL	NULL	<QL	NULL	<QL	10-Aug-12	8-Aug-12
NULL	NULL	NR	NULL	NR	10-Aug-12	8-Aug-12
NULL	NULL	NR	NULL	NR	10-Sep-12	7-Sep-12
NULL	NULL	NR	NULL	NR	10-Oct-12	4-Oct-12
NULL	NULL	NR	NULL	NR	10-Nov-12	9-Nov-12
NULL	NULL	<QL	NULL	<QL	10-Nov-12	9-Nov-12
NULL	NULL	NR	NULL	NR	10-Dec-12	10-Dec-12
NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
NULL	NULL	<QL	NULL	<QL	10-Feb-13	10-Dec-12
NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
NULL	NULL	NR	NULL	NR	10-Jul-13	1-Jul-13

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NULL	NULL	NULL	10-Aug-13	9-Aug-13
		NULL	NULL	NR	NULL	NR	10-Aug-13	8-Jul-13
		NULL	NULL	NR	NULL	NR	10-Sep-13	9-Sep-13
		NULL	NULL	NR	NULL	NR	10-Oct-13	8-Oct-13
		NULL	NULL	NR	NULL	NR	10-Nov-13	8-Nov-13
		NULL	NULL	<QL	NULL	<QL	10-Nov-13	8-Nov-13
		NULL	NULL	NR	NULL	NR	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	<QL	NULL	<QL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	NR	NULL	NR	10-Jun-14	6-Jun-14
		NULL	NULL	10	NULL	10	10-Jul-14	10-Jul-14
		NULL	NULL	10	NULL	10	10-Aug-14	10-Jul-14
		NULL	NULL	NR	NULL	NR	10-Aug-14	8-Aug-14
		NULL	NULL	NR	NULL	NR	10-Sep-14	4-Sep-14
		NULL	NULL	NR	NULL	NR	10-Oct-14	8-Oct-14
		NULL	NULL	13	NULL	13	10-Nov-14	3-Nov-14
		NULL	NULL	13	NULL	13	10-Nov-14	3-Nov-14
		NULL	NULL	NR	NULL	NR	10-Dec-14	5-Dec-14
		NULL	NULL	NR	NULL	NR	10-Jan-15	6-Jan-15
		NULL	NULL	8.9	NULL	8.9	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-Jul-15	NULL
		NULL	NULL	NR	NULL	NR	10-Oct-15	10-Oct-15
		NULL	NULL	11	NULL	11	10-Nov-15	2-Nov-15
TEMPERATURE, WATER (DEG. C)		NULL	NULL	18	NULL	31	10-Dec-11	9-Dec-11
		NULL	NULL	21	NULL	32	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		NULL	NULL	27	NULL	31	10-Jun-12	8-Jun-12
		NULL	NULL	29.6	NULL	37.1	10-Jul-12	4-Jul-12
		NULL	NULL	31.9	NULL	35.6	10-Aug-12	8-Aug-12
		NULL	NULL	31.4	NULL	35.6	10-Sep-12	7-Sep-12
		NULL	NULL	27.2	NULL	31.6	10-Oct-12	4-Oct-12
		NULL	NULL	22.1	NULL	27.5	10-Nov-12	9-Nov-12
		NULL	NULL	14.55	NULL	18.6	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		NULL	NULL	28.84	NULL	32.3	10-Jul-13	1-Jul-13
		NULL	NULL	32.11	NULL	35.4	10-Aug-13	9-Aug-13
		NULL	NULL	30.5	NULL	35.7	10-Sep-13	9-Sep-13
		NULL	NULL	32.1	NULL	41.1	10-Oct-13	8-Oct-13
		NULL	NULL	24.7	NULL	30.8	10-Nov-13	8-Nov-13
		NULL	NULL	21.24	NULL	25.9	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	22.36	NULL	25.1	10-Jun-14	6-Jun-14

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	30.9	NULL	42.3	10-Jul-14	10-Jul-14
		NULL	NULL	33	NULL	39	10-Aug-14	8-Aug-14
		NULL	NULL	31	NULL	34	10-Sep-14	4-Sep-14
		NULL	NULL	30	NULL	33	10-Oct-14	8-Oct-14
		NULL	NULL	26	NULL	32.6	10-Nov-14	3-Nov-14
		NULL	NULL	14	NULL	17	10-Dec-14	5-Dec-14
		NULL	NULL	16	NULL	18	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-May-15	5-May-15
		NULL	NULL	27.1	NULL	31.7	10-Jun-15	4-Jun-15
		NULL	NULL	31.7	NULL	38.3	10-Jul-15	8-Jul-15
		NULL	NULL	33.5	NULL	38.1	10-Aug-15	4-Aug-15
		NULL	NULL	37	NULL	44	10-Sep-15	10-Sep-15
		NULL	NULL	35	NULL	42	10-Oct-15	8-Oct-15
		NULL	NULL	24	NULL	30	10-Nov-15	2-Nov-15
		NULL	NULL	25	NULL	28	10-Dec-15	1-Dec-15
				33.05	90th	24.45		
SILVER, TOTAL RECOVERABLE (µg/L)		NULL	NULL	NR	NULL	NR	10-Dec-11	9-Dec-11
		NULL	NULL	NR	NULL	NR	10-Jan-12	5-Jan-12
		NULL	NULL	NULL	NULL	NULL	10-Feb-12	30-Jan-12
		NULL	NULL	<QL	NULL	<QL	10-Feb-12	21-Nov-11
		NULL	NULL	NULL	NULL	NULL	10-Mar-12	7-Mar-12
		NULL	NULL	NULL	NULL	NULL	10-Apr-12	9-Apr-12
		NULL	NULL	NULL	NULL	NULL	10-May-12	3-May-12
		NULL	NR	NULL	NR	NR	10-Jun-12	8-Jun-12
		NULL	NR	NULL	NR	NR	10-Jul-12	4-Jul-12
		NULL	<QL	NULL	<QL	<QL	10-Aug-12	8-Aug-12
		NULL	NR	NULL	NR	NR	10-Aug-12	8-Aug-12
		NULL	NR	NULL	NR	NR	10-Sep-12	7-Sep-12
		NULL	NR	NULL	NR	NR	10-Oct-12	4-Oct-12
		NULL	NR	NULL	NR	NR	10-Nov-12	9-Nov-12
		NULL	<QL	NULL	<QL	<QL	10-Nov-12	9-Nov-12
		NULL	NR	NULL	NR	NR	10-Dec-12	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Jan-13	4-Jan-13
		NULL	NULL	NULL	NULL	NULL	10-Feb-13	1-Feb-13
		NULL	<QL	NULL	<QL	<QL	10-Feb-13	10-Dec-12
		NULL	NULL	NULL	NULL	NULL	10-Mar-13	1-Mar-13
		NULL	NULL	NULL	NULL	NULL	10-Apr-13	5-Apr-13
		NULL	NULL	NULL	NULL	NULL	10-May-13	1-May-13
		NULL	NULL	NULL	NULL	NULL	10-Jun-13	7-Jun-13
		NULL	NR	NULL	NR	NR	10-Jul-13	1-Jul-13
		NULL	NULL	NULL	NULL	NULL	10-Aug-13	9-Aug-13
		NULL	NR	NULL	NR	NR	10-Aug-13	8-Jul-13
		NULL	NR	NULL	NR	NR	10-Sep-13	9-Sep-13
		NULL	NR	NULL	NR	NR	10-Oct-13	8-Oct-13
		NULL	<QL	NULL	<QL	<QL	10-Nov-13	8-Nov-13
		NULL	NR	NULL	NR	NR	10-Nov-13	8-Nov-13
		NULL	NR	NULL	NR	NR	10-Dec-13	10-Dec-13
		NULL	NULL	NULL	NULL	NULL	10-Jan-14	8-Jan-14
		NULL	NULL	NULL	NULL	NULL	10-Feb-14	5-Feb-14
		NULL	<QL	NULL	<QL	<QL	10-Feb-14	5-Feb-14
		NULL	NULL	NULL	NULL	NULL	10-Mar-14	4-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-Apr-14	31-Mar-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NULL	NULL	NULL	NULL	10-May-14	1-May-14
		NULL	NR	NULL	NR	NR	10-Jun-14	6-Jun-14
		NULL	<QL	NULL	<QL	<QL	10-Jul-14	10-Jul-14
		NULL	<QL	NULL	<QL	<QL	10-Aug-14	10-Jul-14
		NULL	NR	NULL	NR	NR	10-Aug-14	8-Aug-14
		NULL	NR	NULL	NR	NR	10-Sep-14	4-Sep-14

Outfall	Parameter	Quant Avg	Quanti Max	Conc Avg	Conc Min	Conc Max	Due Date	Received Date
		NULL	NULL	NR	NULL	NR	10-Oct-14	8-Oct-14
		NULL	NULL	<QL	NULL	<QL	10-Nov-14	3-Nov-14
		NULL	NULL	<QL	NULL	<QL	10-Nov-14	3-Nov-14
		NULL	NULL	NR	NULL	NR	10-Dec-14	5-Dec-14
		NULL	NULL	NR	NULL	NR	10-Jan-15	6-Jan-15
		NULL	NULL	NULL	NULL	NULL	10-Feb-15	3-Feb-15
		NULL	NULL	<QL	NULL	<QL	10-Feb-15	3-Feb-15
		NULL	NULL	NULL	NULL	NULL	10-Mar-15	5-Mar-15
		NULL	NULL	NULL	NULL	NULL	10-Apr-15	6-Apr-15
		NULL	NULL	NULL	NULL	NULL	10-Jul-15	NULL
		NULL	NULL	NR	NULL	NR	10-Oct-15	10-Oct-15
		NULL	NULL	<QL	NULL	<QL	10-Nov-15	2-Nov-15

VA0003867 – Omega Protein Inc.

MSTRANTI DATA SOURCE REPORT FOR OUTFALL 995

Stream Information:	Basis
Mean Hardness	Not Applicable for Salt Water
90 th % Temperature (Annual)	Ambient Data for Station 7-COC001.61
90 th % Temperature (Winter)	No Tiered Limitations, Not Applicable
90 th % Maximum pH	Ambient Data for Station 7-COC001.61
10 th % Maximum pH	Ambient Data for Station 7-COC001.61
Tier Designation	Flow Frequency Memorandum
Mean Salinity	Ambient Data for Station 7-COC001.61
Mixing Information:	
Design Flow	Maximum 30 Day Value as Reported in Form 2C Application
Acute WLA Multiplier	Agency default per GM00-2011
Chronic WLA Multiplier	
Human Health WLA Multiplier	
Effluent Information:	
Mean Hardness	Not Applicable for Salt Water
90 th % Temperature (Annual)	DMR Effluent Data
90 th % Temperature (Winter)	No Tiered Limitations, Not Applicable
90 th % Maximum pH	Ambient Data for Station 7-COC001.61
10 th % Maximum pH	
Discharge Flow	Maximum 30 Day Value as Reported in Form 2C Application

SALTWATER AND TRANSITION ZONES
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Omega Protein, Inc. - Outfall 995
 Receiving Stream: Cockrell Creek, UT

Permit No.: VA0003867

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information			Mixing Information			Effluent Information		
Mean Hardness (as CaCO ₃) =	NA	mg/l	Design Flow (MGD)	6.821		Mean Hardness (as CaCO ₃) =	NA	mg/L
90th % Temperature (Annual) =	28.5	(° C)	Acute WLA multiplier	2		90 % Temperature (Annual) =	33.05	(° C)
90th % Temperature (Winter) =		(° C)	Chronic WLA multiplier	50		90 % Temperature (Winter) =		(° C)
90th % Maximum pH =	8.4		Human health WLA multiplier	50		90 % Maximum pH =	8.44	SU
10th % Maximum pH =	7.6					10 % Maximum pH =	7.96	SU
Tier Designation (1 or 2) =	1					Discharge Flow =	6.821	MGD
Early Life Stages Present Y/N =	Y							
Tidal Zone =	1	(1 = saltwater, 2 = transition zone)						
Mean Salinity =	16	(g/kg)						

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
Acenaphthene	0	--	--	9.9E+02	--	--	5.0E+04	--	--	--	--	--	--	--	--	5.0E+04
Acrolein	0	--	--	9.3E+00	--	--	4.7E+02	--	--	--	--	--	--	--	--	4.7E+02
Acrylonitrile ^c	0	--	--	2.5E+00	--	--	1.3E+02	--	--	--	--	--	--	--	--	1.3E+02
Aldrin ^c	0	1.3E+00	--	5.0E-04	2.6E+00	--	2.5E-02	--	--	--	--	--	--	2.6E+00	--	2.5E-02
Ammonia-N (mg/l) - Annual	0	1.07E+00	1.99E-01	--	2.14E+00	9.94E+00	--	--	--	--	--	--	--	2.14E+00	9.94E+00	--
Ammonia-N (mg/l) - Winter	0	8.90E+00	1.46E+00	--	1.78E+01	7.32E+01	--	--	--	--	--	--	--	1.78E+01	7.32E+01	--
Anthracene	0	--	--	4.0E+04	--	--	2.0E+06	--	--	--	--	--	--	--	--	2.0E+06
Antimony	0	--	--	6.4E+02	--	--	3.2E+04	--	--	--	--	--	--	--	--	3.2E+04
Arsenic	0	6.9E+01	3.6E+01	--	1.4E+02	1.8E+03	--	--	--	--	--	--	--	1.4E+02	1.8E+03	--
Benzene ^c	0	--	--	5.1E+02	--	--	2.6E+04	--	--	--	--	--	--	--	--	2.6E+04
Benzidine ^c	0	--	--	2.0E-03	--	--	1.0E-01	--	--	--	--	--	--	--	--	1.0E-01
Benzo (a) anthracene ^c	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	--	--	9.0E+00
Benzo (b) fluoranthene ^c	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	--	--	9.0E+00
Benzo (k) fluoranthene ^c	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	--	--	9.0E+00
Benzo (a) pyrene ^c	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	--	--	9.0E+00
Bis2-Chloroethyl Ether ^c	0	--	--	5.3E+00	--	--	2.7E+02	--	--	--	--	--	--	--	--	2.7E+02
Bis2-Chloroisopropyl Ether	0	--	--	6.5E+04	--	--	3.3E+06	--	--	--	--	--	--	--	--	3.3E+06
Bis2-Ethylhexyl Phthalate ^c	0	--	--	2.2E+01	--	--	1.1E+03	--	--	--	--	--	--	--	--	1.1E+03
Bromoform ^c	0	--	--	1.4E+03	--	--	7.0E+04	--	--	--	--	--	--	--	--	7.0E+04
Butylbenzylphthalate	0	--	--	1.9E+03	--	--	9.5E+04	--	--	--	--	--	--	--	--	9.5E+04
Cadmium	0	4.0E+01	8.8E+00	--	8.0E+01	4.4E+02	--	--	--	--	--	--	--	8.0E+01	4.4E+02	--
Carbon Tetrachloride ^c	0	--	--	1.6E+01	--	--	8.0E+02	--	--	--	--	--	--	--	--	8.0E+02
Chlordane ^c	0	9.0E-02	4.0E-03	8.1E-03	1.8E-01	2.0E-01	4.1E-01	--	--	--	--	--	--	1.8E-01	2.0E-01	4.1E-01

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
TRC	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorine Prod. Oxidant	0	1.3E+01	7.5E+00	--	2.6E+01	3.8E+02	--	--	--	--	--	--	--	2.6E+01	3.8E+02	--
Chlorobenzene	0	--	--	1.6E+03	--	--	8.0E+04	--	--	--	--	--	--	--	--	8.0E+04
Chlorodibromomethane ^c	0	--	--	1.3E+02	--	--	6.5E+03	--	--	--	--	--	--	--	--	6.5E+03
Chloroform	0	--	--	1.1E+04	--	--	5.5E+05	--	--	--	--	--	--	--	--	5.5E+05
2-Chloronaphthalene	0	--	--	1.6E+03	--	--	8.0E+04	--	--	--	--	--	--	--	--	8.0E+04
2-Chlorophenol	0	--	--	1.5E+02	--	--	7.5E+03	--	--	--	--	--	--	--	--	7.5E+03
Chlorpyrifos	0	1.1E-02	5.6E-03	--	2.2E-02	2.8E-01	--	--	--	--	--	--	--	2.2E-02	2.8E-01	--
Chromium III	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium VI	0	1.1E+03	5.0E+01	--	2.2E+03	2.5E+03	--	--	--	--	--	--	--	2.2E+03	2.5E+03	--
Chrysene ^c	0	--	--	1.8E-02	--	--	9.0E-01	--	--	--	--	--	--	--	--	9.0E-01
Copper	0	9.3E+00	6.0E+00	--	1.9E+01	3.0E+02	--	--	--	--	--	--	--	1.9E+01	3.0E+02	--
Cyanide, Free	0	1.0E+00	1.0E+00	1.6E+04	2.0E+00	5.0E+01	8.0E+05	--	--	--	--	--	--	2.0E+00	5.0E+01	8.0E+05
DDD ^c	0	--	--	3.1E-03	--	--	1.6E-01	--	--	--	--	--	--	--	--	1.6E-01
DDE ^c	0	--	--	2.2E-03	--	--	1.1E-01	--	--	--	--	--	--	--	--	1.1E-01
DDT ^c	0	1.3E-01	1.0E-03	2.2E-03	2.6E-01	5.0E-02	1.1E-01	--	--	--	--	--	--	2.6E-01	5.0E-02	1.1E-01
Demeton	0	--	1.0E-01	--	--	5.0E+00	--	--	--	--	--	--	--	--	5.0E+00	--
Diazinon	0	8.2E-01	8.2E-01	--	1.6E+00	4.1E+01	--	--	--	--	--	--	--	1.6E+00	4.1E+01	--
Dibenz(a,h)anthracene ^c	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	--	--	9.0E+00
1,2-Dichlorobenzene	0	--	--	1.3E+03	--	--	6.5E+04	--	--	--	--	--	--	--	--	6.5E+04
1,3-Dichlorobenzene	0	--	--	9.6E+02	--	--	4.8E+04	--	--	--	--	--	--	--	--	4.8E+04
1,4-Dichlorobenzene	0	--	--	1.9E+02	--	--	9.5E+03	--	--	--	--	--	--	--	--	9.5E+03
3,3-Dichlorobenzidine ^c	0	--	--	2.8E-01	--	--	1.4E+01	--	--	--	--	--	--	--	--	1.4E+01
Dichlorobromomethane ^c	0	--	--	1.7E+02	--	--	8.5E+03	--	--	--	--	--	--	--	--	8.5E+03
1,2-Dichloroethane ^c	0	--	--	3.7E+02	--	--	1.9E+04	--	--	--	--	--	--	--	--	1.9E+04
1,1-Dichloroethylene	0	--	--	7.1E+03	--	--	3.6E+05	--	--	--	--	--	--	--	--	3.6E+05
1,2-trans-dichloroethylene	0	--	--	1.0E+04	--	--	5.0E+05	--	--	--	--	--	--	--	--	5.0E+05
2,4-Dichlorophenol	0	--	--	2.9E+02	--	--	1.5E+04	--	--	--	--	--	--	--	--	1.5E+04
1,2-Dichloropropane ^c	0	--	--	1.5E+02	--	--	7.5E+03	--	--	--	--	--	--	--	--	7.5E+03
1,3-Dichloropropene ^c	0	--	--	2.1E+02	--	--	1.1E+04	--	--	--	--	--	--	--	--	1.1E+04
Dieldrin ^c	0	7.1E-01	1.9E-03	5.4E-04	1.4E+00	9.5E-02	2.7E-02	--	--	--	--	--	--	1.4E+00	9.5E-02	2.7E-02
Diethyl Phthalate	0	--	--	4.4E+04	--	--	2.2E+06	--	--	--	--	--	--	--	--	2.2E+06
2,4-Dimethylphenol	0	--	--	8.5E+02	--	--	4.3E+04	--	--	--	--	--	--	--	--	4.3E+04
Dimethyl Phthalate	0	--	--	1.1E+06	--	--	5.5E+07	--	--	--	--	--	--	--	--	5.5E+07
Di-n-Butyl Phthalate	0	--	--	4.5E+03	--	--	2.3E+05	--	--	--	--	--	--	--	--	2.3E+05
2,4 Dinitrophenol	0	--	--	5.3E+03	--	--	2.7E+05	--	--	--	--	--	--	--	--	2.7E+05
2-Methyl-4,6-Dinitrophenol	0	--	--	2.8E+02	--	--	1.4E+04	--	--	--	--	--	--	--	--	1.4E+04
2,4-Dinitrotoluene ^c	0	--	--	3.4E+01	--	--	1.7E+03	--	--	--	--	--	--	--	--	1.7E+03
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	5.1E-08	--	--	2.6E-06	--	--	--	--	--	--	--	--	2.6E-06
1,2-Diphenylhydrazine ^c	0	--	--	2.0E+00	--	--	1.0E+02	--	--	--	--	--	--	--	--	1.0E+02
Alpha-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	6.8E-02	4.4E-01	4.5E+03	--	--	--	--	--	--	6.8E-02	4.4E-01	4.5E+03

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
Beta-Endosulfan	0	3.4E-02	8.7E-03	8.9E+01	6.8E-02	4.4E-01	4.5E+03	--	--	--	--	--	--	6.8E-02	4.4E-01	4.5E+03
Alpha + Beta Endosulfan	0	3.4E-02	8.7E-03	--	6.8E-02	4.4E-01	--	--	--	--	--	--	--	6.8E-02	4.4E-01	--
Endosulfan Sulfate	0	--	--	8.9E+01	--	--	4.5E+03	--	--	--	--	--	--	--	--	4.5E+03
Endrin	0	3.7E-02	2.3E-03	6.0E-02	7.4E-02	1.2E-01	3.0E+00	--	--	--	--	--	--	7.4E-02	1.2E-01	3.0E+00
Endrin Aldehyde	0	--	--	3.0E-01	--	--	1.5E+01	--	--	--	--	--	--	--	--	1.5E+01
Ethylbenzene	0	--	--	2.1E+03	--	--	1.1E+05	--	--	--	--	--	--	--	--	1.1E+05
Fluoranthene	0	--	--	1.4E+02	--	--	7.0E+03	--	--	--	--	--	--	--	--	7.0E+03
Fluorene	0	--	--	5.3E+03	--	--	2.7E+05	--	--	--	--	--	--	--	--	2.7E+05
Guthion	0	--	1.0E-02	--	--	5.0E-01	--	--	--	--	--	--	--	--	5.0E-01	--
Heptachlor ^c	0	5.3E-02	3.6E-03	7.9E-04	1.1E-01	1.8E-01	4.0E-02	--	--	--	--	--	--	1.1E-01	1.8E-01	4.0E-02
Heptachlor Epoxide ^c	0	5.3E-02	3.6E-03	3.9E-04	1.1E-01	1.8E-01	2.0E-02	--	--	--	--	--	--	1.1E-01	1.8E-01	2.0E-02
Hexachlorobenzene ^c	0	--	--	2.9E-03	--	--	1.5E-01	--	--	--	--	--	--	--	--	1.5E-01
Hexachlorobutadiene ^c	0	--	--	1.8E+02	--	--	9.0E+03	--	--	--	--	--	--	--	--	9.0E+03
Hexachlorocyclohexane Alpha-BHC ^c	0	--	--	4.9E-02	--	--	2.5E+00	--	--	--	--	--	--	--	--	2.5E+00
Hexachlorocyclohexane Beta-BHC ^c	0	--	--	1.7E-01	--	--	8.5E+00	--	--	--	--	--	--	--	--	8.5E+00
Hexachlorocyclohexane Gamma-BHC ^c (Lindane)	0	1.6E-01	--	1.8E+00	3.2E-01	--	9.0E+01	--	--	--	--	--	--	3.2E-01	--	9.0E+01
Hexachlorocyclopentadiene	0	--	--	1.1E+03	--	--	5.5E+04	--	--	--	--	--	--	--	--	5.5E+04
Hexachloroethane ^c	0	--	--	3.3E+01	--	--	1.7E+03	--	--	--	--	--	--	--	--	1.7E+03
Hydrogen Sulfide	0	--	2.0E+00	--	--	1.0E+02	--	--	--	--	--	--	--	--	1.0E+02	--
Indeno (1,2,3-cd) pyrene C	0	--	--	1.8E-01	--	--	9.0E+00	--	--	--	--	--	--	--	--	9.0E+00
Isophorone ^c	0	--	--	9.6E+03	--	--	4.8E+05	--	--	--	--	--	--	--	--	4.8E+05
Kepone	0	--	0.0E+00	--	--	0.0E+00	--	--	--	--	--	--	--	--	0.0E+00	--
Lead	0	2.4E+02	9.3E+00	--	4.8E+02	4.7E+02	--	--	--	--	--	--	--	4.8E+02	4.7E+02	--
Malathion	0	--	1.0E-01	--	--	5.0E+00	--	--	--	--	--	--	--	--	5.0E+00	--
Mercury	0	1.8E+00	9.4E-01	--	3.6E+00	4.7E+01	--	--	--	--	--	--	--	3.6E+00	4.7E+01	--
Methyl Bromide	0	--	--	1.5E+03	--	--	7.5E+04	--	--	--	--	--	--	--	--	7.5E+04
Methylene Chloride ^c	0	--	--	5.9E+03	--	--	3.0E+05	--	--	--	--	--	--	--	--	3.0E+05
Methoxychlor	0	--	3.0E-02	--	--	1.5E+00	--	--	--	--	--	--	--	--	1.5E+00	--
Mirex	0	--	0.0E+00	--	--	0.0E+00	--	--	--	--	--	--	--	--	0.0E+00	--
Nickel	0	7.4E+01	8.2E+00	4.6E+03	1.5E+02	4.1E+02	2.3E+05	--	--	--	--	--	--	1.5E+02	4.1E+02	2.3E+05
Nitrobenzene	0	--	--	6.9E+02	--	--	3.5E+04	--	--	--	--	--	--	--	--	3.5E+04
N-Nitrosodimethylamine ^c	0	--	--	3.0E+01	--	--	1.5E+03	--	--	--	--	--	--	--	--	1.5E+03
N-Nitrosodiphenylamine ^c	0	--	--	6.0E+01	--	--	3.0E+03	--	--	--	--	--	--	--	--	3.0E+03
N-Nitrosodi-n-propylamine ^c	0	--	--	5.1E+00	--	--	2.6E+02	--	--	--	--	--	--	--	--	2.6E+02
Nonylphenol	0	7.0E+00	1.7E+00	--	1.4E+01	8.5E+01	--	--	--	--	--	--	--	1.4E+01	8.5E+01	--
Parathion	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB Total ^c	0	--	3.0E-02	6.4E-04	--	1.5E+00	3.2E-02	--	--	--	--	--	--	--	1.5E+00	3.2E-02
Pentachlorophenol ^c	0	1.3E+01	7.9E+00	3.0E+01	2.6E+01	4.0E+02	1.5E+03	--	--	--	--	--	--	2.6E+01	4.0E+02	1.5E+03

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria			Wasteload Allocations			Antidegradation Baseline			Antidegradation Allocations			Most Limiting Allocations		
		Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH	Acute	Chronic	HH
Phenol	0	--	--	8.6E+05	--	--	4.3E+07	--	--	--	--	--	--	--	--	4.3E+07
Phosphorus (Elemental)	0	--	1.0E-01	--	--	5.0E+00	--	--	--	--	--	--	--	--	5.0E+00	--
Pyrene	0	--	--	4.0E+03	--	--	2.0E+05	--	--	--	--	--	--	--	--	2.0E+05
Selenium	0	2.9E+02	7.1E+01	4.2E+03	5.8E+02	3.6E+03	2.1E+05	--	--	--	--	--	--	5.8E+02	3.6E+03	2.1E+05
Silver	0	1.9E+00	--	--	3.8E+00	--	--	--	--	--	--	--	--	3.8E+00	--	--
1,1,2,2-Tetrachloroethane ^C	0	--	--	4.0E+01	--	--	2.0E+03	--	--	--	--	--	--	--	--	2.0E+03
Tetrachloroethylene ^C	0	--	--	3.3E+01	--	--	1.7E+03	--	--	--	--	--	--	--	--	1.7E+03
Thallium	0	--	--	4.7E-01	--	--	2.4E+01	--	--	--	--	--	--	--	--	2.4E+01
Toluene	0	--	--	6.0E+03	--	--	3.0E+05	--	--	--	--	--	--	--	--	3.0E+05
Toxaphene ^C	0	2.1E-01	2.0E-04	2.8E-03	4.2E-01	1.0E-02	1.4E-01	--	--	--	--	--	--	4.2E-01	1.0E-02	1.4E-01
Tributyltin	0	4.2E-01	7.4E-03	--	8.4E-01	3.7E-01	--	--	--	--	--	--	--	8.4E-01	3.7E-01	--
1,2,4-Trichlorobenzene	0	--	--	7.0E+01	--	--	3.5E+03	--	--	--	--	--	--	--	--	3.5E+03
1,1,2-Trichloroethane ^C	0	--	--	1.6E+02	--	--	8.0E+03	--	--	--	--	--	--	--	--	8.0E+03
Trichloroethylene ^C	0	--	--	3.0E+02	--	--	1.5E+04	--	--	--	--	--	--	--	--	1.5E+04
2,4,6-Trichlorophenol ^C	0	--	--	2.4E+01	--	--	1.2E+03	--	--	--	--	--	--	--	--	1.2E+03
Vinyl Chloride ^C	0	--	--	2.4E+01	--	--	1.2E+03	--	--	--	--	--	--	--	--	1.2E+03
Zinc	0	9.0E+01	8.1E+01	2.6E+04	1.8E+02	4.1E+03	1.3E+06	--	--	--	--	--	--	1.8E+02	4.1E+03	1.3E+06

Notes:

- All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
- Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipalities
- Metals measured as Dissolved, unless specified otherwise
- "C" indicates a carcinogenic parameter
- For transition zone waters, spreadsheet prints the lesser of the freshwater and saltwater water quality criteria.
- Regular WLA = (WQC x WLA multiplier) - (WLA multiplier - 1)(background conc.)
- Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
= (0.1(WQC - background conc.) + background conc.) for human health
- Antideg. WLA = (Antideg. Baseline)(WLA multiplier) - (WLA multiplier - 1)(background conc.)

Site Specific Target Value (SSTV)	
Metal	Target Value (SSTV)
Antimony	3.2E+04
Arsenic III	5.5E+01
Cadmium	3.2E+01
Chromium III	#VALUE!
Chromium VI	8.8E+02
Copper	7.4E+00
Lead	1.9E+02
Mercury	1.4E+00
Nickel	5.9E+01
Selenium	2.3E+02
Silver	1.5E+00
Zinc	7.2E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Chemical = **Copper, dissolved** (ug/L)
Chronic averaging period = 4
WLAa = 19
WLAc = 300
Q.L. = 5
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 8
Variance = 23.04
C.V. = 0.6
97th percentile daily values = 19.4673
97th percentile 4 day average = 13.3103
97th percentile 30 day average= 9.64842
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 19
Average Weekly Limit = 19
Average Monthly Limit = 19

The data are:

8

Chemical = **Silver, dissolved** (ug/L)
Chronic averaging period = 4
WLAa = 3.8
WLAc =
Q.L. = 50
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 50
Variance = 900
C.V. = 0.6
97th percentile daily values = 121.670
97th percentile 4 day average = 83.1895
97th percentile 30 day average= 60.3026
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 3.8
Average Weekly Limit = 3.8
Average Monthly Limit = 3.8

The data are:

50

Chemical = Zinc, dissolved (ug/L)

Chronic averaging period = 4

WLAa = 180

WLAc = 4100

Q.L. = 5

samples/mo. = 1

samples/wk. = 1

Summary of Statistics:

observations = 1

Expected Value = 11

Variance = 43.56

C.V. = 0.6

97th percentile daily values = 26.7675

97th percentile 4 day average = 18.3016

97th percentile 30 day average= 13.2665

< Q.L. = 0

Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

11

ATTACHMENT K

Refrigeration Water Evaluation

ATTACHMENT K - REFRIGERATION WATER DISCHARGES

Correspondence regarding refrigeration water discharges dates back to 1982, when State Water Control Board (SWCB) indicated the need to address refrigeration water under the VPDES program. At that time, the Attorney General's Office deemed that the refrigeration water is process water, not harvesting water. Additionally, EPA did not address refrigeration water in the Effluent Guideline Limitations for Fish Meal Processing Facilities. At that time EPA advised agency staff that limitations for the refrigeration water should be addressed based on Best Professional Judgment. In order to do this staff needed to characterize the discharge. However, no further documentation existed in the file showing that characterization of refrigeration water had been conducted. In recent permit iterations, the permittee was required to monitor ambient water conditions prior to and after the discharge of refrigeration water to ensure that the discharge of refrigeration water did not contribute to the impairment of the receiving waters.

Past operating procedures included the withdrawal of approximately 3,000 to 5,000 gallons of seawater during the fishing process; as the fish was pumped aboard and dewatered as much as possible, part of the water that was withdrawn had to be discharged immediately to maintain the stability of the vessels. Approximately 200-1000 gallons of water would be kept, chilled and re-circulated through the fish holds to maintain the fish as fresh as possible until the vessels could offload the fish at the plant. Once the fish had been unloaded, the vessels would head back to the Chesapeake Bay to dispose of the remaining refrigeration water (approximately 200-1000 gallons) east of a line between Great Wicomico River Light (formerly known as Fleeton Point Light) and Green Can Buoy No. 3, in the Chesapeake Bay. During the 2011 permit reissuance, the permittee was required to monitor the refrigeration water discharges rather than the ambient water quality before and after discharge. In addition, the permit required regular monitoring of ammonia, BOD, nitrate + nitrite, TKN, and TP, and the submittal of annual refrigeration water reports to include total loadings for each parameter discharged into the Bay. See below for pollutants concentrations and loadings summary. The results provided showed high concentrations of all pollutants, and total nitrogen loadings that exceeded the equivalent TN load in 2013 and 2014 for a significant discharger to the Chesapeake Bay in accordance with 9VAC25-720. However, the facility has been consistently below the assigned TN WLA of 21,213 lbs/year for its process wastewater, which offsets the TN loadings exceedances of the refrigeration water discharges.

During meetings in April and May 2016, the facility clarified recent procedures for the refrigeration water disposals. Currently, the 200-1000 gallons of seawater that are kept in each vessel to maintain the fish fresh until offload is no longer being discharged east of the Great Wicomico-Green Can Buoy # 3 line. Rather, this water is being utilized as bail water during the unloading process, contained in tanks, and ultimately discharged in the Atlantic Ocean. This procedure results to be both economically achievable and advantageous for the following reasons:

- 1) It eliminates the discharge into the Chesapeake Bay of 200-1000 gallons of water with extremely high loadings of organic pollutants and nutrients;
- 2) Vessels are no longer required to waste resources for the disposal of the refrigeration water into the Bay;
- 3) The refrigeration water is cooler than the well water that has been withdrawn to be used as bail water, therefore allowing better preservation of the fish during the unloading process.

For the reasons listed above, DEQ assumed the position that refrigeration water discharges into the Chesapeake Bay should no longer be authorized with the 2016 Permit reissuance. However, during the May 2016 meeting, Omega presented concerns over the disposal of the water withdrawn during fishing operations, refrigerated to a certain degree, and periodically discharged in order to maintain the boats stability and the holding capacity of the fish holds. Questions arose regarding whether this periodic discharge would be covered under EPA Vessel General Permit (VGP), since this water does not fully

meet the definition of once-through ambient water that is included as an exception of water to be regulated by the VGP.

In an email dated May 23, 2016 EPA provided its position over the coverage of periodic discharges of refrigerated water under the VGP (see **Attachment N**): the VGP requires such discharges to be to shore based facilities to the extent they are economically achievable. However, EPA does not envision vessels having to return to shore, and thereby disrupting fishing operations, for the sole purpose of discharging fish hold water. As such, Omega's lack of treatment facility availability is appropriate regarding discharges of refrigerated water from the fish holds during fishing operations. The once-through ambient water provision in the permit authorizes those discharges pierside and elsewhere, without a requirement to discharge to a shore-based facility. The difference being that when pierside, other fish hold effluents must be discharged to a shore-based facility when "available." Omega is therefore not required to hold and transport the fishing operations refrigerated water onshore for treatment as it is neither economically achievable nor available.

With the 2016 Permit reissuance, Omega will no longer be authorized to discharge the 200-1000 gallons of refrigeration water into the Chesapeake Bay as it has been demonstrated economically achievable and advantageous to otherwise use it as bail water. However, The facility will be authorize to discharge the refrigerated water from the fish holds during fishing operations whenever necessary to maintain list, trim and the holding capacity of the vessels (see special condition I.B.2).

Omega Protein, Inc. - Refrigeration Water Data Summary

Date	Dempster						Fleeton						Tangier Island					
	Ammonia (mg/L)	BOD (mg/L)	Nitrate+Nitrite (mg/L)	TKN (mg/L)	TP (mg/L)	Salinity (ppt)	Ammonia (mg/L)	BOD (mg/L)	Nitrate+Nitrite (mg/L)	TKN (mg/L)	TP (mg/L)	Salinity (ppt)	Ammonia (mg/L)	BOD (mg/L)	Nitrate+Nitrite (mg/L)	TKN (mg/L)	TP (mg/L)	Salinity (ppt)
Nov-15																		
Oct-15																		
Sep-15	211	10645	ND	2120	202.8	20.8	250	25700	ND	4930	354	18.9						
Aug-15													120	5360	ND	3250	117.3	19
Jul-15							273	>31300	0.15	7600	462.8	19						
Jun-15																		
May-15	39.4	1905	7.62	270	53.13	12.9												
Nov-14							16.5	1465	0.7	219.2	32.85	16.6	39.4	4335	1.2	522.6	77.55	15.6
Oct-14													74.2	13020	0.4	1799	176.39	21.8
Sep-14																		
Aug-14																		
Jun-14																		
Nov-13							91.3	11130	0.5	1835.2	196.25	22.4						
Oct-13	61.3	>2950	0.5	1352	74.74	19.2							58.8	>2960	0.2	459	63	21.6
Sep-13																		
Aug-13																		
Jul-13							59.9	906	1.1	1767.8	312.79	20	129	1142	2.5	2477.1	304.9	19.9
Jun-13	34.4	>2950	1.5	700	67.5	15												
Nov-12	16.3	56	0.1	26.8	2.61	19.1												
Oct-12																		
Aug-12																		
Jul-12	183.5	>30250	<0.1	5256.4	469.32	8.9												
Jun-12																		
May-12													35.9	2388	0.28	410.4	48.36	11.6

Omega Protein

Omega Protein

Year	Month	BOD5	TKN	NO2/NO3	TN	TP
		lbs				
2015	May	181.75	27.1	0.88	27.98	5.39
	June	1536.15	250.35	0.41	250.76	23.02
	July	6612.16	1739.26	0.1	1739.36	95.49
	August	2300.55	481.34	0	481.34	40.12
	September	1557.18	235.33	0	235.33	18.59
	October	130.43	26.24	0.02	26.26	2.32
	November	92.92	18.94	0	18.94	1.39
	Total	12411.14	2778.56	1.41	2779.97	186.32
2014	May	1462.04	177.61	0.51	178.12	24.79
	June	3558.66	535.18	0.86	536.04	68.49
	July	15079	2328.06	1.13	2329.19	287.62
	August	7769.2	1267.89	0.05	1267.94	99.89
	September	8566.56	2170.12	0.12	2170.24	145.51
	October	1957.4	276.71	0.13	276.84	27.75
	November	72.6	9.29	0.02	9.31	1.38
	Total	38608.91	6785.32	2.83	6788.15	659.58
2013	June	1738.49	496.93	0.91	497.84	49.88
	July	820.35	1700.34	1.44	1701.78	247.41
	August	12789.38	1906.14	0.33	1906.47	173.57
	September	7328.38	2838.89	1.04	2839.93	206.02
	October	665.81	204.01	0.08	204.09	15.52
	November	1320.53	265.48	0.17	265.65	25.18
	Total	24662.94	7411.79	3.97	7415.76	717.58
2012	May	1798.82	327.97	0.18	328.15	29.94
	June	1079.83	259.55	0.17	259.72	24.02
	July	5462.64	880.19	0.02	880.21	89.94
	August	2244.14	410.86	0.05	410.91	32.58
	September	4123.1	754.84	0.28	755.12	69.06
	October	2481.22	448.97	0.35	449.32	35.75
	November	3.67	2.17	0.01	2.18	0.26
	Total	17193.42	3084.55	1.06	3085.61	281.55

ATTACHMENT L

Groundwater Monitoring Data Evaluation



DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296

804/527-5020

MEMORANDUM

To: File

From: Laura Galli, VPDES Permit Writer

Subject: Permit Reissuance Groundwater Evaluation

VPDES Permit VA0003867 Omega Protein, Inc.

Date: February 3, 2016

Background

The Omega Protein, Inc. facility (the Facility) is located at 610 Menhaden Road in Reedville, Virginia. The Facility is located adjacent to Cockrell Creek, a tributary to the Chesapeake Bay. The Facility maintains two wastewater lagoons previously used to contain and treat wastewater from menhaden fish processing. The lagoons have been out of use since 2009, and have received only rain water since that time. Six groundwater monitoring wells (MWL-1 through MWL-6) are located outside the bermed area surrounding the lagoons (**Figure 1**). The facility's Groundwater Monitoring Plan (GWMP) was approved on May 6, 2006; the plan requires quarterly data collection from the six groundwater monitoring wells for the following parameters of concern (COCs): aluminum, ammonia, chloride, conductivity, copper, dissolved oxygen, E. Coli, nitrate, pH, phosphorus, , silver, total organic carbon, and turbidity.

In compliance with permit special condition I.B.10.b. and c., a Groundwater Site Characterization Risk Analysis and Corrective Action Plan (CAP) was submitted on October 3, 2012. The Plan's objectives were the following:

- Confirm the groundwater flow direction and the locations of the six monitoring wells relative to groundwater flow around the lagoons (i.e., upgradient/background wells vs. downgradient wells) within the surficial aquifer beneath the facility;
- Evaluate current and historical groundwater concentrations and potential trends of the permit-defined COCs in the surficial aquifer beneath the facility;
- Qualitatively assess potential risks associated with the permit-defined COCs in groundwater in the surficial aquifer beneath the facility; and
- Evaluate the feasibility of monitored natural attenuation (MNA) as a corrective action for potential groundwater impacts from the permit-defined COCs.

The plan provided several statistical comparisons of data from 2006 to 2012 from upgradient wells (MWL-5 and MWL-6) and downgradient wells (MWL-1 through MWL-4), and a risk assessment based on the results of the statistical analyses. The following conclusions and recommendations were made:

- The wastewater lagoons appear to have contributed to ammonia and nitrate in groundwater in the surficial aquifer beneath the facility. The rates of increase of nitrate are relatively low and may be related

to decreases in ammonia concentrations, indicating that ammonia is being converted to nitrate in groundwater via nitrification. Although potential impacts to surface water in Cockrell Creek are unlikely, and the surficial aquifer is not used as a source of drinking water in the area, a CAP should be warranted for these COCs as ammonia is a primary component of the facility's wastewater and is the apparent source of nitrate in groundwater.

- Phosphorous did not show any trends in facility groundwater and is not subject to a Groundwater Quality Standard or Criteria. However, because phosphorous is associated with the facility's wastewater, continued monitoring for this COC was recommended.
- Copper, silver, and aluminum have been demonstrated to not be related to the facility wastewater lagoons. Copper has never been detected above its Groundwater Quality Standard, silver has never been detected, and aluminum showed a downward trend and no significant difference from background. Therefore, copper, silver, and aluminum should be removed from the facility's Groundwater Monitoring Plan.
- Chloride and TOC were shown to be related to naturally-occurring background sources rather than the facility's wastewater lagoons. Therefore, the plan recommended the removal of chloride and TOC from the facility's GWMP.
- *E. coli* was shown to be the result of fecal matter from various water fowl (e.g., seagulls) that inhabit the facility rather from the facility's wastewater system. Therefore, the plan recommended the removal of *E. coli* from the facility's Groundwater Monitoring Plan.

The selected remedy for the remaining COCs (ammonia and nitrate) was Monitored Natural Attenuation (MNA), which consists of monitoring COCs concentrations in groundwater over time to demonstrate that natural attenuation is occurring as shown by decreases in COCs concentrations. The CAP for MNA of ammonia and nitrate would consist of continued quarterly groundwater monitoring for these COCs in all groundwater monitoring wells as per the Facility's GWMP.

Groundwater Analysis and Evaluation 2006 – 2015

The 2012 Groundwater Site Characterization Risk Analysis and Corrective Action Plan was not addressed by DEQ at that time and monitoring at the facility continued on a quarterly basis for all the original COCs in accordance with the 2006 GWMP. As part of the 2016 permit reissuance, a new groundwater analysis and evaluation was performed, to include the more recent data collected from 2012 through 2015.

The data were evaluated for normality using the DEQ Piedmont Regional Office, Groundwater Analysis Spreadsheet which employs the Shapiro-Wilk Test of Normality. Non-normal data were assessed using a nonparametric test of significance (Wilcoxon Rank Sum Test), while normal data was assessed for a significant difference using Cochran's approximation to the Behrens-Fisher Student's t-test with a 5% level of significance. The statewide groundwater standards and criteria applicable to this facility are listed in **Table 1**. The facility falls in the Coastal Plain Physiographic Province for which there are also some specific standards and criteria. The results of the tests of significance are presented in **Appendix A**.

Table 1

Parameter	GW Standard or Criteria	Parameter	GW Standard or Criteria
Aluminum	N/A	Nitrate	5 mg/L ⁽²⁾
Ammonia	0.025 mg/L ⁽²⁾	pH	6.5-9 ⁽²⁾
Chloride	50 mg/L ⁽³⁾	Phosphorus	N/A
Conductivity	N/A	Silver	N/A
Copper	1.0 mg/L ⁽¹⁾	TOC	10 mg/L ⁽³⁾
DO	N/A	Turbidity	N/A
<i>E. coli</i>	N/A		

(1) Groundwater standards applicable statewide (9 VAC 25-280-40)

(2) Groundwater standards for the Coastal Plain Physiographic province (9 VAC 25-280-50)

(3) Groundwater criteria for the Coastal Plain Physiographic province (9 VAC 25-280-70)

Aluminum

The aluminum data for MWL-1, MWL-2, and MWL-4 are non-normal distributed and show a non-significant difference with the background well. MWL-3 and MWL-5 data show a significant difference only in the Shapiro-Wilk Log-Normality Test. However, the data show a general slight decrease in concentration in all wells.

Ammonia

The data reported as "less than" exceed the GW standard for ammonia as the statistical analysis considers these data as half of the reported concentration (<0.1 mg/L is considered as 0.05 mg/L). Therefore, all the data reported for ammonia from 2006 to 2015 result being greater than the groundwater standard of 0.025mg/L. Wells MWL-1, MWL-2, MWL-4, and MWL-5 do not show a significant difference from the background well. MWL-3 shows a significant difference only in the Shapiro-Wilk Log-Normality Test. Downgradient wells MWL-1 through MWL-4 show a slight decrease in concentrations over time, while the background well MWL-6 and MWL-5 (which is also upgradient of the lagoons) have registered a slight increase in concentration.

Chloride

The data for chloride appear to follow a slight decrease trend overtime in all wells except in the background well (slight increase). Although the downgradient wells do not show a statistically significant difference with the upgradient well according to the Shapiro-Wilk Normality Test, chloride concentrations have consistently exceeded the groundwater criterion in MWL-1 and MWL-2. Exceedance of the GW criterion in MWL-3 and MWL-5 occurred repeatedly, although concentrations have decreased to levels below the criteria since 2013 (MWL-3) and 2014 (MWL-5). The GW criterion has not been exceeded in MWL-4 since 2008, while it has never been exceeded in MWL-6.

Conductivity

Conductivity values appear to have followed a stable trend over time.

Copper

The data for copper appear to follow a slight decrease trend over time in all wells except in MWL-3 (slight increase). The concentrations for copper in the downgradient wells do not show a significant difference with the background well, and never exceeded the GW standard.

Dissolved Oxygen

Downgradient wells do not show a statistically significant difference with the background well. All wells except MWL-3 show a slight increase in concentrations, with a very weak data linearity. Therefore, DO concentrations appear to follow a fairly stable trend overtime in all wells.

E. coli

This parameter has registered a few hits in concentration over time which do not appear to have followed any particular pattern (although it appears that all wells except for MWL-3 registered a peak in concentrations in March 2013 and June 2015). Well MWL-1 has had the most frequent hits, followed by MWL-5 and MWL-6, while concentrations have always been undetected at MWL-3.

Nitrate

No statistically significant differences appear to be present between downgradient wells and upgradient well. However, the GW standard for nitrate has been exceeded consistently in wells MWL-2, MWL-3, MWL-4 and MWL-5. In addition, all wells, except MWL-3, appear to show a slight increase in concentrations over time.

pH

No statistically significant differences appear to be present between downgradient wells and upgradient well. The pH values show a slight decrease overtime, and have been outside of the GW lower standard of 6.5 S.U. in all wells since 2006.

Phosphorus

The data for phosphorus appear to follow a slight decrease trend over time in all wells except in MWL-3 (slight increase). The concentrations for phosphorus in the downgradient wells do not show a significant difference with the background well.

Silver

This parameter has never been detected in the monitoring well network since 2006.

Temperature

Temperature values have registered a consistent seasonal variation in all wells, showing a slight increase only in the two wells located upgradient of the lagoons (MWL-5 and MWL-6).

TOC

The parameter has exceeded the GW criterion consistently in MWL-1, while occasional exceedances occurred in MWL-2 starting in 2013, indicating a general increase in concentrations at this well over time. Only one exceedance occurred in MWL-5 in 2011, while no exceedances occurred in MWL-3, MWL-4, and in the background well. Statistical analyses show a general slight increase in concentration for this parameter in all wells over time.

Turbidity

No significant difference between downgradient wells and background well are present for this parameter, which has shown a fairly stable trend over time in all wells.

Recommendations and Conclusions

- In agreement with the October 2012 Plan, aluminum, copper and silver do not appear to be related to the facility's wastewater lagoons. Copper has never been detected above its GW standard, silver has never been detected in the facility's groundwater samples, and aluminum showed a downward trend and no significant difference from background. Therefore, copper, silver, and aluminum should be removed from the facility's GWMP.
- Because of the chloride exceedance of its GW criterion, its monitoring in the groundwater should continue for the next permit cycle for all wells except for MWL-4, where concentrations have fallen below the criterion since 2008.
- *E. coli* has been shown to be the result of fecal matter from wildlife that inhabits the lagoons, rather from the facility's wastewater system. In addition, bacteria limitations have been removed from the permit in 2015. Therefore, *E. coli* should be removed from the facility's GWMP.
- Phosphorus appears not to be a parameter of concern in any of the wells and therefore should be removed from the GWMP.
- Quarterly monitoring of the field parameters (conductivity, turbidity, temperature, DO and ORP) should continue as required by the GWMP as they are indicators of overall groundwater quality.
- pH values have been consistently below the lower GW standard range of 6.5 S.U. in all wells, including the upgradient well. This may suggest that pH degradation in the groundwater is not directly associated with the lagoons, and that other sources of pH degradation may exist. Quarterly pH monitoring should continue in all wells.
- Because of the exceedence of the GW criterion, quarterly TOC monitoring should continue in monitoring wells MWL-1 and MWL-2, and in the background well MWL-6.
- In agreement with the October 2012 Plan, the wastewater lagoons appear to have contributed to ammonia and nitrate to groundwater in the surficial aquifer beneath the facility. Despite the apparent impact to the surficial aquifer, potential impacts to surface water in Cockrell Creek are unlikely. Furthermore, the surficial aquifer is not used as a source of drinking water in the area and so potential impacts to drinking water wells are unlikely. Continued quarterly monitoring of ammonia and nitrate is required.

In agreement with the October 2012 Plan, Monitored Natural Attenuation shall be implemented as the facility's groundwater corrective action. Within 60 days of the effective date of the 2016 Permit, the facility shall submit a revised Groundwater Monitoring Plan to reflect the changes in COCs and monitoring network as described above for approval.

Appendix A

Groundwater Data Statistical Analyses

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein, Inc.						
Permit No.:	VA0003867						
Monitoring Parameter:	Aluminum						
Applicable GW Standard (if none leave blank):							
Applicable GW Criteria (if none leave blank):							
Concentration Units (all data):	mg/L						
Data Entry							
Well Designation ►	MWL-6	MWL-1	MWL-2	MWL-3	MWL-4	MWL-5	
Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5	
1	11/29/2007	15.5	56.4	97.5	117	124	48.5
2	3/25/2008	7.56	19.5	40.7	21.1	52.7	8.41
3	4/1/2008	5.29	25.6	50.8	50.4	52.2	10.1
4	8/29/2008	3.71	21.4	45.3	68.4	86.5	29.3
5	12/4/2008	14.7	1.39	90.6	53	102	33.5
6	1/1/2009	3.18	13.5	29.2	18	21	16.7
7	4/1/2009	16.7	2.05	46.9	68.8	53.8	19.6
8	8/31/2009	7.19	4.92	0.435	0.491	18.9	38
9	12/17/2009	0.858	2.6	7.22	2.18	11.7	5.58
10	1/1/2010	5.6	1.1	2.73	1.98	1.65	4.97
11	4/1/2010	0.263	3.52	0.877	1.64	1.88	1.08
12	7/1/2010	2.75	0.886	0.668	0.05	0.194	1.75
13	10/1/2010	0.437	0.93	9.04	0.223	0.953	9.3
14	2/28/2011	0.555	16.8	7.64	0.153	0.224	1.85
15	5/19/2011	0.323	0.849	0.633	0.135	<0.025	1.47
16	8/18/2011	0.025	4.76	56.6	5.22	2.85	0.777
17	12/28/2011	0.673	2.98	0.814	1.92	14.1	1.77
18	3/15/2012	0.754	0.65	0.738	0.314	0.071	1.17
19	6/14/2012	0.183	0.369	1.18	0.969	0.11	0.102
20	9/5/2012	1.03	3.561	10.94	65.14	7.9	8.46
21	12/3/2012	2.543	6.61	9.06	13.24	15.99	11.04
22	3/5/2013	0.78	26.21	25.84	8.084	29.35	5.283
23	6/6/2013	23.43	5.666	8.13	20.93	22.2	17.21
24	9/3/2013	4.89	24.3	99	152	49.2	22.7
25	12/3/2013	2.543	2.25	3.72	5.02	9.51	1.33
26	3/6/2014	2.329	8.388	4.137	5.324	18.97	2.998
27	6/3/2014	2.76	10.106	7.943	10.367	22.91	6.549
28	9/3/2014	2.989	13.627	7.534	26.948	60.272	4.376
29	12/9/2014	3.337	10.784	10.367	9.507	24.647	2.926
30	3/13/2015	0.604	<0.005	<0.005	2.24	<0.005	2.14
31	6/24/2015	0.593	3.48	2.8	2.37	1.3	4.57
32	9/3/2015	4.42	14.7	3.74	36.8	25.8	2.35
33	12/8/2015	1.414	5.635	16.095	8.112	14.565	1.562
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

Results: Significance to Background **				
Distribution Tests		Non-normal Test	Normal Tests	
Shapiro-Wilk Normality Test	Shapiro-Wilk Log Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
MWL-6 Background Well	Not normal	Normal	N/A	
MWL-1 Compliance Well #1	Not normal	Not normal	Not Significant	Significant
MWL-2 Compliance Well #2	Not normal	Not normal	Not Significant	Significant
MWL-3 Compliance Well #3	Not normal	Normal	Not Significant	Significant
MWL-4 Compliance Well #4	Not normal	Not normal	Not Significant	Significant
MWL-5 Compliance Well #5	Not normal	Normal	Not Significant	Significant

** Please note that the above cells will appear blank in cases where a test cannot be conducted due to lack of data, or if the test assumptions are invalid due to lack of data variation.

Results: Linear Regression Trend Analysis and				
Regression Line Slope	Pearson Correlation (R)	Interpretation		Degree of Data Linearity
		Linear Trend		
MWL-6 Background Well	-0.001978504	-0.319252115	Slight Decrease	Moderately Weak
MWL-1 Compliance Well #1	-0.003417164	-0.263775838	Slight Decrease	Moderately Weak
MWL-2 Compliance Well #2	-0.013928265	-0.430190335	Slight Decrease	Moderately Weak
MWL-3 Compliance Well #3	-0.00900431	-0.224464429	Slight Decrease	Very Weak
MWL-4 Compliance Well #4	-0.014604164	-0.41891048	Slight Decrease	Moderately Weak
MWL-5 Compliance Well #5	-0.00708926	-0.525942029	Slight Decrease	Moderately Strong

Groundwater Standard		Groundwater Criteria		Total No. of Data Points
No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
MWL-6 Background Well				33
MWL-1 Compliance Well #1				33
MWL-2 Compliance Well #2				33
MWL-3 Compliance Well #3				33
MWL-4 Compliance Well #4				33
MWL-5 Compliance Well #5				33

Maximum Value	Minimum Value	Average		
MWL-6 Background Well	23.430	0.025	4.240	
MWL-1 Compliance Well #1	56.400	0.369	9.860	
MWL-2 Compliance Well #2	99.000	0.435	21.840	
MWL-3 Compliance Well #3	152.000	0.050	23.577	
MWL-4 Compliance Well #4	124.000	0.071	27.337	
MWL-5 Compliance Well #5	48.500	0.102	9.922	

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Ammonia
Applicable GW Standard (if none leave blank):	0.025
Applicable GW Criteria (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	0.23	12	60	2.2	0.12	2.98
2	9/8/2006	<0.1	12	25	1.55	<0.1	1.27
3	10/1/2006	<0.1	16	22	1.4	<0.1	1.96
4	2/28/2007	0.24	29	37	0.67	0.14	3.39
5	5/30/2007	<0.1	14	6.82	2.05	<0.1	1.56
6	9/27/2007	<0.1	10	22	1.27	<0.1	3.6
7	11/29/2007	<0.1	11.7	19.6	1.45	<0.1	2.41
8	3/25/2008	<0.1	8.9	8.89	0.55	<0.1	1.03
9	4/1/2008	<0.1	10.3	10.4	1.07	<0.1	<0.1
10	8/29/2008	<0.05	12	14.4	1.62	0.16	2.15
11	12/4/2008	<0.1	1.65	12.4	0.95	0.18	4.65
12	1/1/2009	<0.1	10.8	9.83	0.8	<0.1	2.97
13	4/1/2009	<0.1	11.1	8.21	1.67	<0.1	2.32
14	8/31/2009	<0.1	3.49	11.3	0.95	<0.1	1.11
15	12/17/2009	<0.1	0.53	8.08	0.68	<0.1	3.34
16	1/1/2010	<0.1	3.41	8.52	0.25	<0.1	0.6
17	4/1/2010	<0.1	0.21	9.23	0.33	<0.1	2.73
18	7/1/2010	<0.1	6.62	11.5	0.64	<0.1	5.23
19	10/1/2010	<0.1	13.5	9.72	1.21	<0.1	1.66
20	2/28/2011	<0.1	25.4	11.7	0.29	<0.1	1.7
21	5/19/2011	<0.1	3.15	8.94	0.19	<0.1	2
22	8/18/2011	<0.1	22.5	12.9	1.09	<0.1	4.22
23	12/28/2011	<0.1	5.25	12.1	0.42	<0.1	1.47
24	3/15/2012	<0.1	4.49	9.05	0.15	<0.1	1.16
25	6/14/2012	<0.1	32.2	15	2.92	<0.1	3.01
26	9/5/2012	<0.2	12.8	12.6	2.3	0.3	2.7
27	12/3/2012	<0.2	16.6	13.4	0.8	0.2	3.2
28	3/5/2013	<0.2	3.3	8.63	0.4	<0.2	<0.6
29	6/6/2013	<0.2	13.6	19.1	1.7	<0.2	1.4
30	9/3/2013	<0.2	<0.2	21.8	2.6	15.4	2.54
31	12/3/2013	<0.2	6.1	21.1	0.8	<0.2	3.2
32	3/6/2014	<0.2	6	15	0.4	<0.2	1.6
33	6/3/2014	<0.2	8.2	18.2	1.4	<0.2	3.3
34	9/3/2014	<0.2	6.2	20.2	1.7	<0.2	2.6
35	12/9/2014	<0.2	6.3	19.8	0.2	2.2	2.7
36	3/13/2015	<0.2	3.24	20.3	0.8	<0.2	16.29
37	6/24/2015	<0.2	2.65	15.1	<0.2	1.68	1.1
38	9/3/2015	<0.2	6.34	20.2	1.8	0.93	2.54
39	12/8/2015	<0.2	3.66	13.1	0.38	<0.2	2.29
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Not normal	Normal	Not Significant	Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Significant	Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	7.30792E-06	0.167145893	Slight Increase	Very Weak
Compliance Well #1	-0.002118225	-0.293114287	Slight Decrease	Moderately Weak
Compliance Well #2	-0.001753669	-0.194116412	Slight Decrease	Very Weak
Compliance Well #3	-0.000111129	-0.160516074	Slight Decrease	Very Weak
Compliance Well #4	0.000509947	0.217137492	Slight Increase	Very Weak
Compliance Well #5	0.000486738	0.204298859	Slight Increase	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well	38	97.4%			39
Compliance Well #1	39	100%			39
Compliance Well #2	39	100%			39
Compliance Well #3	39	100%			39
Compliance Well #4	39	100%			39
Compliance Well #5	39	100%			39

	Maximum Value	Minimum Value	Average		
Background Well	0	0	0		
Compliance Well #1	32	0	10		
Compliance Well #2	60	7	16		
Compliance Well #3	3	0	1		
Compliance Well #4	15	0	2		
Compliance Well #5	16	1	3		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Chloride
Applicable GW Standard (if none leave blank):	50
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	7.5	140	320	190	9.3	120
2	9/8/2006	6.1	100	270	110	13	19
3	10/1/2006	7.2	120	220	100	14	41
4	2/28/2007	6.5	9.9	150	25	13	52
5	5/30/2007	8.5	100	96	79	49	34
6	9/27/2007	7.2	110	240	100	12	57
7	11/29/2007	7.1	111	186	109	9.5	45
8	3/25/2008	5.6	102	106	90.4	24.2	56.8
9	4/1/2008	7.7	98.7	122	79.5	33.1	33.6
10	8/29/2008	6.3	103	157	93.3	54.5	54.5
11	12/4/2008	4.65	373	1.65	12.4	0.95	0.18
12	1/1/2009	4.5	131	126	62.7	53	100
13	4/1/2009	7.6	186	149	98.2	37.6	146
14	8/31/2009	9.6	120	185	94.5	32.7	135
15	12/17/2009	7.0	115	120	82.4	22.2	97.8
16	1/1/2010	6.8	116	158	33.2	12.8	14.8
17	4/1/2010	7.3	69.2	251	82.8	17.9	66.6
18	7/1/2010	3.9	129	300	84.5	23.1	129
19	10/1/2010	6.1	156	251	102	17.7	75.7
20	2/28/2011	6	197	192	10.7	15.3	58.7
21	5/19/2011	6.2	144	209	19.3	6.8	12.4
22	8/18/2011	5.3	134	255	80.5	12.2	63.1
23	12/28/2011	5.8	98.7	192	35.4	13.4	39.2
24	3/15/2012	5.5	73.9	117	23.8	11.7	30.5
25	6/14/2012	5.4	104	209	74.6	9.5	44.7
26	9/5/2012	5	91	240	74	14	51
27	12/3/2012	6	94	197	62	12	49
28	3/5/2013	5	82	84	26	13	25
29	6/6/2013	6	61	124	32	14	31
30	9/3/2013	10	13	190	52	63	50
31	12/3/2013	6	81	185	26	12	56
32	3/6/2014	8	63	120	17	11	44
33	6/3/2014	11	50	109	30	13	50
34	9/3/2014	6	41	157	30	9	47
35	12/9/2014	11	46	190	13	10	45
36	3/13/2015	8.144	32.73	115.7	14.64	6.926	16.29
37	6/24/2015	5.581	20.05	65.45	11.09	7.851	23.56
38	9/3/2015	4.863	37.93	107.3	24.58	9.847	36.92
39	12/8/2015	9.097	58.54	124.5	16.49	20.96	31.78
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Significant	Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	0.000192993	0.119118619	Slight Increase	Very Weak
Compliance Well #1	-0.027089775	-0.455614867	Slight Decrease	Moderately Weak
Compliance Well #2	-0.017963084	-0.28055423	Slight Decrease	Moderately Weak
Compliance Well #3	-0.026903934	-0.704383815	Slight Decrease	Moderately Strong
Compliance Well #4	-0.003411142	-0.248408096	Slight Decrease	Very Weak
Compliance Well #5	-0.009216254	-0.285462108	Slight Decrease	Moderately Weak

No. Violations of GW Standard	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well			0	0%	39
Compliance Well #1			32	82.1%	39
Compliance Well #2			38	97.4%	39
Compliance Well #3			21	53.8%	39
Compliance Well #4			3	7.7%	39
Compliance Well #5			18	46.2%	39

	Maximum Value	Minimum Value	Average		
Background Well	11	4	7		
Compliance Well #1	373	10	100		
Compliance Well #2	320	2	169		
Compliance Well #3	190	11	59		
Compliance Well #4	63	1	19		
Compliance Well #5	146	0	53		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Conductivity
Applicable GW Standard (if none leave blank):	
Concentration Units (all data):	us/cm

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	1150	658	1255	658	1282	581
2	9/8/2006	147	535	1371	518	201	369
3	10/1/2006	129	565	945	278	160	455
4	2/28/2007	115	517	780	307	136	391
5	5/30/2007	124	513	586	283	165	249
6	9/27/2007	114	556	1213	70	157	288
7	11/29/2007	123	517	846	562	127	365
8	3/25/2008	166	651	790	563	256	630
9	4/1/2008	136	1072	764	1149	370	530
10	8/29/2008	135	1047	1179	838	295	410
11	12/4/2008	1065	NR	1035	483	415	753
12	1/1/2009	1236	226	1079	649	321	925
13	4/1/2009	111	1736	913	725	323	895
14	8/31/2009	125	1417	1272	929	344	557
15	12/17/2009	158	1167	1129	824	323	1157
16	1/1/2010	166	998	1020	841	333	121
17	4/1/2010	122.7	890	1402	360	195.5	448
18	7/1/2010	117.3	1459	1590	709	250	721
19	10/1/2010	125	1314	1231	671	201	827
20	2/28/2011	110	1324	1075	380	182	490
21	5/19/2011	98.6	897	1154	341	191	212
22	8/18/2011	186	920	1164	700	175	488
23	12/28/2011	292	871	1213	393	197	466
24	3/15/2012	106	731	899	315	200	468
25	6/14/2012	49	922	1030	624	106	268
26	9/5/2012	92	1130	1580	812	167	405
27	12/3/2012	95	929	106	451	158	319
28	3/5/2013	132.8	993	779	317	241	362
29	6/6/2013	76	746	997	185	146	148
30	9/3/2013	90	720	1433	247	166	142
31	12/3/2013	119	714	1173	350	146	429
32	3/6/2014	76	597	630	218	115	323
33	6/3/2014	94	509	952	413	142	429
34	9/3/2014	93	633	1446	533	147	513
35	12/9/2014	75	574	1302	228	156	395
36	3/13/2015	104	459	1198	328	146	234
37	6/24/2015	76	414	826	288	165	267
38	9/3/2015	80	536	1334	499	165	380
39	12/8/2015	128	703	1168	292	150	354
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Normal	Normal	Not Significant	Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Significant	Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	-0.095627928	-0.35709704	Slight Decrease	Moderately Weak
Compliance Well #1	-0.034465091	-0.109468299	Slight Decrease	Very Weak
Compliance Well #2	0.029138898	0.105070771	Slight Increase	Very Weak
Compliance Well #3	-0.074797206	-0.327492379	Slight Decrease	Moderately Weak
Compliance Well #4	-0.0768648	-0.428028545	Slight Decrease	Moderately Weak
Compliance Well #5	-0.067260768	-0.315383293	Slight Decrease	Moderately Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well					39
Compliance Well #1					38
Compliance Well #2					39
Compliance Well #3					39
Compliance Well #4					39
Compliance Well #5					39

	Maximum Value	Minimum Value	Average		
Background Well	1236	49	198		
Compliance Well #1	1736	226	820		
Compliance Well #2	1590	106	1073		
Compliance Well #3	1149	70	496		
Compliance Well #4	1282	106	234		
Compliance Well #5	1157	121	455		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Copper
Applicable GW Standard (if none leave	1
Applicable GW Criteria (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	0.02	0.043	0.058	<0.01	0.046	<0.01
2	9/8/2006	<0.01	0.035	0.035	<0.01	0.046	0.011
3	10/1/2006	<0.01	0.035	0.038	<0.01	0.023	<0.01
4	2/28/2007	<0.01	0.042	0.027	<0.01	0.026	<0.01
5	5/30/2007	<0.01	0.02	0.017	<0.01	<0.01	<0.01
6	9/27/2007	<0.015	0.028	0.072	0.062	0.067	0.048
7	11/29/2007	<0.01	0.017	0.027	<0.01	0.043	0.018
8	3/25/2008	<0.01	0.014	0.023	<0.01	0.029	<0.01
9	4/1/2008	<0.01	0.022	0.032	0.022	0.029	<0.01
10	8/29/2008	<0.01	0.018	0.016	<0.01	0.024	0.011
11	12/4/2008	<0.01	0.012	0.052	0.025	0.058	0.018
12	1/1/2009	<0.01	0.011	<0.01	<0.01	<0.01	<0.01
13	4/1/2009	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	8/31/2009	<0.01	0.21	<0.01	<0.01	<0.01	<0.01
15	12/17/2009	<0.01	0.0117	<0.01	<0.01	<0.01	<0.01
16	1/1/2010	<0.01	<0.01	<0.01	<0.01	0.012	<0.01
17	4/1/2010	<0.01	0.0192	<0.01	<0.01	<0.01	<0.01
18	7/1/2010	<0.01	0.0315	<0.01	<0.01	<0.01	<0.01
19	10/1/2010	<0.01	0.0125	<0.01	<0.01	<0.01	<0.01
20	2/28/2011	<0.01	0.0106	<0.01	<0.01	<0.01	<0.01
21	5/19/2011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	8/18/2011	<0.01	0.016	<0.01	<0.01	<0.01	<0.01
23	12/28/2011	<0.01	0.0166	<0.01	<0.01	<0.01	<0.01
24	3/15/2012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	6/14/2012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	9/5/2012	<0.01	<0.01	0.016	0.065	<0.01	0.014
27	12/3/2012	<0.01	0.014	0.011	0.016	0.021	0.01
28	3/5/2013	<0.01	0.029	0.016	<0.01	0.017	<0.01
29	6/6/2013	<0.01	<0.01	<0.01	0.016	0.01	0.011
30	9/3/2013	<0.01	<0.01	<0.01	0.058	0.074	0.023
31	12/3/2013	<0.01	0.015	<0.01	<0.01	<0.01	<0.01
32	3/6/2014	<0.01	0.02	<0.01	<0.01	0.017	<0.01
33	6/3/2014	<0.01	0.013	<0.01	<0.01	0.013	<0.01
34	9/3/2014	<0.01	0.016	<0.01	0.013	0.026	<0.01
35	12/9/2014	<0.01	0.017	0.011	<0.01	0.023	<0.01
36	3/13/2015	<0.01	0.018	0.01	<0.01	0.0125	<0.01
37	6/24/2015	<0.01	0.04	<0.01	<0.01	<0.01	0.022
38	9/3/2015	<0.01	0.026	0.013	0.026	0.018	<0.01
39	12/8/2015	<0.01	0.023	0.015	0.011	0.013	<0.01
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Significant	Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	-7.10059E-07	-0.308303922	Slight Decrease	Moderately Weak
Compliance Well #1	-5.142E-06	-0.166511271	Slight Decrease	Very Weak
Compliance Well #2	-9.13574E-06	-0.586955291	Slight Decrease	Moderately Strong
Compliance Well #3	1.18281E-06	0.079413734	Slight Increase	Very Weak
Compliance Well #4	-5.36601E-06	-0.307484391	Slight Decrease	Moderately Weak
Compliance Well #5	-8.75825E-07	-0.112694939	Slight Decrease	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well	0	0%			39
Compliance Well #1	0	0%			39
Compliance Well #2	0	0%			39
Compliance Well #3	0	0%			39
Compliance Well #4	0	0%			39
Compliance Well #5	0	0%			39

	Maximum Value	Minimum Value	Average		
	0	0	0		
Background Well	0	0	0		
Compliance Well #1	0	0	0		
Compliance Well #2	0	0	0		
Compliance Well #3	0	0	0		
Compliance Well #4	0	0	0		
Compliance Well #5	0	0	0		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Dissolved Oxygen
Applicable GW Standard (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	6.13	4.61	5.12	2.37	4.32	6.14
2	9/8/2006	2.88	2.87	3.46	3.20	2.72	3.13
3	10/1/2006	10.11	4.36	5.81	5.81	8.62	7.30
4	2/28/2007	4.73	4.13	5.96	9.00	9.10	4.74
5	5/30/2007	3.31	4.43	3.86	5.52	3.71	3.00
6	9/27/2007	3.46	3.36	3.53	3.28	2.32	3.31
7	11/29/2007	1.45	1.29	1.20	1.14	1.19	1.91
8	3/25/2008	1.98	1.46	1.22	1.50	1.10	1.01
9	4/1/2008	1.26	1.23	1.31	1.77	1.63	1.73
10	8/29/2008	0.75	0.45	0.35	0.30	0.35	1.38
11	12/4/2008	2.46	2.40	2.52	2.02	2.32	2.03
12	1/1/2009	1.41	1.17	3.08	3.97	1.45	1.17
13	4/1/2009	1.88	1.90	0.70	1.31	4.01	1.24
14	8/31/2009	3.83	2.68	3.89	3.50	3.15	3.78
15	12/17/2009	2.10	1.41	1.03	0.75	4.50	2.07
16	1/1/2010	2.92	1.81	1.11	1.00	4.11	2.22
17	4/1/2010	1.85	2.01	1.41	3.52	1.38	2.44
18	7/1/2010	1.70	1.18	1.73	1.96	1.25	1.36
19	10/1/2010	2.43	1.55	1.50	2.01	2.20	2.92
20	2/28/2011	2.45	1.37	1.53	1.03	2.17	3.08
21	5/19/2011	2.69	2.9	1.369	1.2	4.06	1.47
22	8/18/2011	1.15	2.18	2.03	0.62	0.99	0.68
23	12/28/2011	4.01	2.83	2.31	1.83	2.22	1.26
24	3/15/2012	2.91	2.27	2.41	2.03	3.01	0.96
25	6/14/2012	0.13	0	0	0	0.02	0
26	9/5/2012	1.89	0.47	0.45	0.33	0.49	0.24
27	12/3/2012	2.9	0.75	0.88	0.8	1.03	0.36
28	3/5/2013	2.35	0.44	1.22	1.69	2.07	0.5
29	6/6/2013	2.71	0.23	0.35	1.92	0.39	0.09
30	9/3/2013	0.8	0.85	0.53	0.71	0.74	0.33
31	12/3/2013	6.81	4	3.57	1.5	2.73	5.42
32	3/6/2014	8.55	3.44	7.22	3.56	4.5	4.05
33	6/3/2014	5.11	0.79	4.36	0.32	0.88	4.87
34	9/3/2014	7.75	0.97	3.58	0.82	1.79	5.16
35	12/9/2014	8.73	4.4	6.06	3.93	5.05	3.6
36	3/13/2015	11.17	7.05	7.12	8.26	9.92	9.12
37	6/24/2015	13.79	9.38	19.93	8.25	14.89	15.62
38	9/3/2015	5.1	1.63	2.15	1.15	2.65	3.63
39	12/8/2015	6.51	3.04	4.21	3.24	6.02	5.24
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Normal		N/A	
Compliance Well #1	Not normal		Not Significant	Not Significant	
Compliance Well #2	Not normal		Not Significant	Not Significant	
Compliance Well #3	Not normal		Not Significant	Not Significant	
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #5	Not normal		Not Significant	Not Significant	

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	0.001192344	0.400402995	Slight Increase	Moderately Weak
Compliance Well #1	0.000118164	0.065244396	Slight Increase	Very Weak
Compliance Well #2	0.000754989	0.234398862	Slight Increase	Very Weak
Compliance Well #3	-0.000180568	-0.085056704	Slight Decrease	Very Weak
Compliance Well #4	0.000317078	0.110193204	Slight Increase	Very Weak
Compliance Well #5	0.000594734	0.212061637	Slight Increase	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well					39
Compliance Well #1					39
Compliance Well #2					39
Compliance Well #3					39
Compliance Well #4					39
Compliance Well #5					39

	Maximum Value	Minimum Value	Average		
Background Well	14	0	4		
Compliance Well #1	9	0	2		
Compliance Well #2	20	0	3		
Compliance Well #3	9	0	2		
Compliance Well #4	15	0	3		
Compliance Well #5	16	0	3		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	E. Coli
Applicable GW Standard (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	<1	<1	<1	<1	<1	<1
2	9/8/2006	<1	48	2	3	<1	5
3	10/1/2006	<1	<1	1	1	<1	<1
4	2/28/2007	<1	<1	<1	<1	<1	<1
5	5/30/2007	<1	<1	1	<1	<1	2
6	9/27/2007	<1	1	<1	<1	<1	<1
7	11/29/2007	<1	<1	<1	<1	<1	<1
8	3/25/2008	<1	4	194	<1	<1	<1
9	4/1/2008	<1	160	<1	<1	<1	<1
10	8/29/2008	<1	3	<1	<1	<1	11
11	12/4/2008	<1	6	<1	<1	<1	<1
12	1/1/2009	<1	<1	<1	<1	<1	<1
13	4/1/2009	71	1	<1	<1	<1	<1
14	8/31/2009	<1	1410	<1	<1	<1	<1
15	12/17/2009	<1	<1	<1	<1	<1	<1
16	1/1/2010	<1	<1	<1	<1	<1	<1
17	4/1/2010	<1	248	<1	<1	<1	<1
18	7/1/2010	<1	2400	<1	<1	<1	<1
19	10/1/2010	<1	5	<1	<1	<1	<1
20	2/28/2011	<1	<1	<1	<1	<1	<1
21	5/19/2011	<1	2419	<1	<1	<1	<1
22	8/18/2011	<1	3	<1	<1	<1	<1
23	12/28/2011	<1	5	<1	<1	<1	<1
24	3/15/2012	<1	2	<1	<1	<1	<1
25	6/14/2012	<1	1	<1	<1	<1	291
26	9/5/2012	<1	2	<1	<1	<1	<1
27	12/3/2012	<1	5	1	<1	<1	<1
28	3/5/2013	276	2420	17	<1	43	2420
29	6/6/2013	<1	<1	<1	<1	<1	201
30	9/3/2013	<1	<1	<1	3	3	<1
31	12/3/2013	<1	10	<1	<1	<1	8
32	3/6/2014	<1	<1	<1	<1	<1	1
33	6/3/2014	<1	12	<1	<1	<1	5
34	9/3/2014	<1	42	<1	<1	<1	2
35	12/9/2014	1	7	<1	<1	<1	<1
36	3/13/2015	<1	<1	<1	<1	<1	<1
37	6/24/2015	32.7	1986	4.1	<1	5.2	101.2
38	9/3/2015	<1	<1	<1	<1	<1	<1
39	12/8/2015	15.6	5.2	<1	<1	1	<1
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Not Significant	Not Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	0.005562988	0.129134347	Slight Increase	Very Weak
Compliance Well #1	0.085397474	0.12310003	Slight Increase	Very Weak
Compliance Well #2	-0.004540613	-0.154180114	Slight Decrease	Very Weak
Compliance Well #3	-0.00011559	-0.29959654	Slight Decrease	Moderately Weak
Compliance Well #4	0.001002757	0.154669847	Slight Increase	Very Weak
Compliance Well #5	0.053761592	0.145483097	Slight Increase	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well					39
Compliance Well #1					39
Compliance Well #2					39
Compliance Well #3					39
Compliance Well #4					39
Compliance Well #5					39

	Maximum Value	Minimum Value	Average		
	276	1	79		
Background Well	276	1	79		
Compliance Well #1	2420	1	448		
Compliance Well #2	194	1	31		
Compliance Well #3	3	1	2		
Compliance Well #4	43	1	13		
Compliance Well #5	2420	1	254		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Nitrate
Applicable GW Standard (if none leave blank):	5
Applicable GW Criteria (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
1	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	0.86	0.10	2.43	10.40	1.76	3.04
2	9/8/2006	0.34	0.10	5.21	10.10	1.66	3.15
3	10/1/2006	1.16	0.10	4.76	4.95	2.19	2.52
4	2/28/2007	0.96	0.10	4.93	8.28	2.23	2.97
5	5/30/2007	0.43	0.10	4.97	9.86	2.08	1.46
6	9/27/2007	0.10	0.33	0.73	6.28	1.99	1.79
7	11/29/2007	0.88	2.78	4.87	3.02	7.30	0.92
8	3/25/2008	1.20	0.92	10.50	3.90	4.16	5.73
9	4/1/2008	0.60	0.50	8.90	5.00	3.50	6.20
10	8/29/2008	0.50	0.50	3.40	10.50	2.50	1.60
11	12/4/2008	0.50	1.80	9.00	7.10	3.90	2.80
12	1/1/2009	0.40	0.30	9.40	9.30	3.70	2.90
13	4/1/2009	0.50	1.30	10.30	14.50	4.00	4.00
14	8/31/2009	1.20	0.10	7.20	18.40	3.10	2.90
15	12/17/2009	0.80	0.80	8.30	17.90	3.90	2.50
16	1/1/2010	0.70	1.80	13.40	13.00	1.20	0.30
17	4/1/2010	0.60	19.00	6.80	11.00	3.00	2.50
18	7/1/2010	1.70	15.50	6.80	13.10	4.00	1.80
19	10/1/2010	1.40	7.90	12.20	8.40	3.90	5.70
20	2/28/2011	1.4	3.1	15.6	9	3.8	4.6
21	5/19/2011	0.3	10.7	13.2	0.05	4.5	1.8
22	8/18/2011	2.2	10.3	11.5	0.05	3.8	2.4
23	12/28/2011	0.7	9.23	14.2	10	4.3	2.4
24	3/15/2012	1	5.8	13.2	11.6	4.4	1.4
25	6/14/2012	0.9	0.7	14.4	12.5	5.4	2.1
26	9/5/2012	2.8	0.6	7.9	12.1	5.4	2.4
27	12/3/2012	3.7	1	11.2	13.2	5.8	2.3
28	3/5/2013	6	5.1	0.06	9.4	7.3	11.1
29	6/6/2013	2.1	0.6	20.5	6.2	7.8	8.7
30	9/3/2013	3.4	5.8	15.2	12.5	0.7	5.5
31	12/3/2013	8.8	3.2	8.2	9.2	5.6	8.7
32	3/6/2014	3.8	1.8	10.9	6.2	5	11.3
33	6/3/2014	3.4	1.6	16.2	10.1	6	10.6
34	9/3/2014	1.2	2.8	13.1	11.2	6	9.7
35	12/9/2014	1.6	2.6	10.4	6.5	6.9	7.2
36	3/13/2015	2.08	2.25	11	6.76	2.36	5.46
37	6/24/2015	1.13	8.54	10.7	5.92	3.84	9.31
38	9/3/2015	1.38	1.1	12.3	9.92	5.74	7.13
39	12/8/2015	6.08	1.88	8.58	6.88	4.89	5.63
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Not Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Significant	Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	0.000974268	0.559255442	Slight Increase	Moderately Strong
Compliance Well #1	0.000810945	0.191615847	Slight Increase	Very Weak
Compliance Well #2	0.002317643	0.5487634	Slight Increase	Moderately Strong
Compliance Well #3	-2.25436E-06	-0.000590227	Slight Decrease	Very Weak
Compliance Well #4	0.000890968	0.532405917	Slight Increase	Moderately Strong
Compliance Well #5	0.001830205	0.62114468	Slight Increase	Moderately Strong

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well	3	7.7%			39
Compliance Well #1	10	25.6%			39
Compliance Well #2	31	79.5%			39
Compliance Well #3	34	87.2%			39
Compliance Well #4	12	30.8%			39
Compliance Well #5	15	38.5%			39

	Maximum Value	Minimum Value	Average		
	9	0	2		
Background Well	19	0	3		
Compliance Well #2	21	0	10		
Compliance Well #3	18	0	9		
Compliance Well #4	8	1	4		
Compliance Well #5	11	0	4		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	pH
Applicable GW Standard (if none leave blank):	6.5-9
Applicable GW Criteria (if none leave blank):	
Concentration Units (all data):	S.U

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	6.71	4.66	6.07	5.70	4.85	4.75
2	9/8/2006	4.99	5.07	4.82	5.45	5.55	5.02
3	10/1/2006	5.74	4.88	4.45	4.93	5.52	6.24
4	2/28/2007	4.08	4.13	4.45	5.24	4.16	3.87
5	5/30/2007	5.82	4.88	4.90	5.82	5.35	6.99
6	9/27/2007	5.99	5.64	5.39	5.32	5.35	5.36
7	11/29/2007	5.54	5.55	5.56	5.54	5.55	5.54
8	3/25/2008	4.54	5.09	5.00	5.76	5.15	4.38
9	4/1/2008	4.73	5.86	5.83	5.63	5.69	4.64
10	8/29/2008	5.48	5.80	5.62	6.56	6.12	5.34
11	12/4/2008	5.76	6.70	5.56	6.13	6.13	5.68
12	1/1/2009	5.83	5.86	6.08	6.32	6.10	6.14
13	4/1/2009	6.06	5.62	5.82	5.34	6.06	6.06
14	8/31/2009	6.04	5.62	5.49	5.41	5.18	6.02
15	12/17/2009	5.38	5.8	5.09	5.75	5.78	5.43
16	1/1/2010	5.43	5.93	5.33	6.02	5.99	5.62
17	4/1/2010	5.13	5.71	4.73	6.28	5.11	5.16
18	7/1/2010	5.21	5.39	4.78	5.69	5.44	4.75
19	10/1/2010	4.7	5.16	4.64	5.55	5.13	4.52
20	2/28/2011	4.87	5.32	4.8	5.92	5.24	4.64
21	5/19/2011	5.9	5.82	4.61	5.83	5.28	5.9
22	8/18/2011	6.34	5.19	4.29	5.14	5.1	4.71
23	12/28/2011	4.51	5.57	4.57	5.62	5.05	4.71
24	3/15/2012	5.37	5.79	5.446	5.86	5.23	6.01
25	6/14/2012	4.36	5.16	4.13	5.25	4.87	5.16
26	9/5/2012	4.35	5.18	4.41	5.31	4.89	4.75
27	12/3/2012	4.19	5.05	4.25	4.5	4.26	4.54
28	3/5/2013	4.38	5.83	4.47	5.78	5.51	4.12
29	6/6/2013	5.3	5.36	4.04	5.9	4.09	6.18
30	9/3/2013	4.5	5.35	4.05	5.69	5.05	6.12
31	12/3/2013	4.66	5.71	4.52	5.77	5.21	4.69
32	3/6/2014	4.67	5.7	4.67	5.52	5.6	4.59
33	6/3/2014	4.31	5.14	4.26	5.21	5.13	4.58
34	9/3/2014	5	5.93	4.95	5.56	6.56	4.92
35	12/9/2014	4.79	5.54	4.37	5.83	5.49	4.7
36	3/13/2015	4.53	6.27	4.68	5.66	7.89	4.65
37	6/24/2015	4.68	5.87	4.86	5.51	6.1	4.28
38	9/3/2015	4.7	5.74	4.59	5.58	5.62	4.86
39	12/8/2015	3.65	5.23	4.04	4.97	5.6	3.97
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Not Significant	Not Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	-0.000378424	-0.568583109	Slight Decrease	Moderately Strong
Compliance Well #1	-0.000209715	-0.344280421	Slight Decrease	Moderately Weak
Compliance Well #2	-0.000324498	-0.590951041	Slight Decrease	Moderately Strong
Compliance Well #3	-5.48526E-05	-0.146651166	Slight Decrease	Very Weak
Compliance Well #4	9.08975E-05	0.143355413	Slight Increase	Very Weak
Compliance Well #5	-0.000243162	-0.350511807	Slight Decrease	Moderately Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well	0	0%			39
Compliance Well #1	0	0%			39
Compliance Well #2	0	0%			39
Compliance Well #3	0	0%			39
Compliance Well #4	0	0%			39
Compliance Well #5	0	0%			39

	Maximum Value	Minimum Value	Average		
	7	4	5		
Background Well	7	4	5		
Compliance Well #1	7	4	5		
Compliance Well #2	6	4	5		
Compliance Well #3	7	5	6		
Compliance Well #4	8	4	5		
Compliance Well #5	7	4	5		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Phosphorus
Applicable GW Standard (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	0.31	<0.05	0.11	0.79	<0.05	<0.05
2	9/8/2006	<0.05	0.62	0.59	0.47	0.15	0.08
3	10/1/2006	0.12	0.26	0.33	0.16	0.24	0.16
4	2/28/2007	0.12	0.18	0.3	0.19	0.06	0.15
5	5/30/2007	0.22	0.27	0.16	0.31	0.54	0.16
6	9/27/2007	0.13	0.49	2.4	2.14	3.29	2.37
7	11/29/2007	0.37	0.4	1.65	0.23	0.68	<0.05
8	3/25/2008	0.1	0.26	0.211	<0.5	0.14	0.1
9	4/1/2008	<0.05	0.3	0.16	0.47	<0.05	0.12
10	8/29/2008	0.16	0.25	0.25	0.29	0.12	0.26
11	12/4/2008	0.64	0.26	0.32	0.12	2.7	0.07
12	1/1/2009	0.19	0.32	0.47	0.17	0.11	0.12
13	4/1/2009	0.16	0.04	0.22	0.1	0.11	0.08
14	8/31/2009	<0.05	0.08	<0.01	0.19	0.15	0.08
15	12/17/2009	0.02	0.11	0.04	0.03	0.07	0.02
16	1/1/2010	0.13	0.23	0.02	0.06	0.05	0.12
17	4/1/2010	0.12	0.4	0.69	0.07	0.04	0.09
18	7/1/2010	0.11	0.17	0.03	0.07	0.13	0.04
19	10/1/2010	0.24	0.21	0.17	0.04	0.13	0.12
20	2/28/2011	0.16	0.22	0.2	0.19	<0.05	0.2
21	5/19/2011	0.11	0.3	0.09	0.06	0.02	0.14
22	8/18/2011	0.05	0.08	0.11	0.1	0.016	0.14
23	12/28/2011	0.05	0.27	0.11	0.06	0.24	0.12
24	3/15/2012	0.03	0.37	0.22	0.13	0.18	0.12
25	6/14/2012	0.03	0.08	0.02	0.04	0.03	0.07
26	9/5/2012	0.21	0.32	0.13	0.52	0.06	0.13
27	12/3/2012	0.04	0.15	0.07	0.09	0.31	0.06
28	3/5/2013	<0.02	0.96	0.38	0.06	0.07	0.21
29	6/6/2013	0.14	0.08	0.03	<0.02	0.04	0.04
30	9/3/2013	0.15	0.14	0.03	0.04	0.11	0.37
31	12/3/2013	0.02	0.12	0.03	0.12	0.04	0.04
32	3/6/2014	0.03	0.21	0.03	0.03	0.09	0.06
33	6/3/2014	<0.02	0.22	0.08	0.06	0.41	0.26
34	9/3/2014	0.03	0.19	0.06	0.11	0.15	0.12
35	12/9/2014	0.1	0.34	0.16	0.1	0.72	0.17
36	3/13/2015	0.03	0.39	0.08	7.83	0.09	0.08
37	6/24/2015	0.03	0.31	0.06	0.02	0.04	0.14
38	9/3/2015	0.08	0.25	0.09	0.18	0.29	0.18
39	12/8/2015	0.1	0.21	0.34	0.43	0.24	0.06
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Not Significant	Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Not Significant	Not Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	-4.6934E-05	-0.410072605	Slight Decrease	Moderately Weak
Compliance Well #1	-4.54171E-06	-0.028190583	Slight Decrease	Very Weak
Compliance Well #2	-0.0001643	-0.383214331	Slight Decrease	Moderately Weak
Compliance Well #3	0.000146607	0.121626118	Slight Increase	Very Weak
Compliance Well #4	-0.000135366	-0.216219914	Slight Decrease	Very Weak
Compliance Well #5	-5.50799E-05	-0.157748188	Slight Decrease	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well					39
Compliance Well #1					39
Compliance Well #2					39
Compliance Well #3					39
Compliance Well #4					39
Compliance Well #5					39

	Maximum Value	Minimum Value	Average		
Background Well	1	0	0		
Compliance Well #1	1	0	0		
Compliance Well #2	2	0	0		
Compliance Well #3	8	0	0		
Compliance Well #4	3	0	0		
Compliance Well #5	2	0	0		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Silver
Applicable GW Standard (if none leave blank):	
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2	9/8/2006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
3	10/1/2006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4	2/28/2007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
5	5/30/2007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
6	9/27/2007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7	11/29/2007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8	3/25/2008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
9	4/1/2008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	8/29/2008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
11	12/4/2008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12	1/1/2009	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
13	4/1/2009	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	8/31/2009	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
15	12/17/2009	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	1/1/2010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
17	4/1/2010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
18	7/1/2010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	10/1/2010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	2/28/2011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	5/19/2011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	8/18/2011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
23	12/28/2011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24	3/15/2012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	6/14/2012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	9/5/2012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	12/3/2012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	3/5/2013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
29	6/6/2013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30	9/3/2013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
31	12/3/2013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
32	3/6/2014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
33	6/3/2014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
34	9/3/2014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
35	12/9/2014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
36	3/13/2015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
37	6/24/2015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
38	9/3/2015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
39	12/8/2015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Not Significant	Not Significant

	Regression Line Slope	Pearson Correlation (R)	Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	-2.24768E-36	-8.97644E-16	Slight Decrease	Very Weak
Compliance Well #1	-2.24768E-36	-8.97644E-16	Slight Decrease	Very Weak
Compliance Well #2	-2.24768E-36	-8.97644E-16	Slight Decrease	Very Weak
Compliance Well #3	-2.24768E-36	-8.97644E-16	Slight Decrease	Very Weak
Compliance Well #4	-2.24768E-36	-8.97644E-16	Slight Decrease	Very Weak
Compliance Well #5	-2.24768E-36	-8.97644E-16	Slight Decrease	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well					39
Compliance Well #1					39
Compliance Well #2					39
Compliance Well #3					39
Compliance Well #4					39
Compliance Well #5					39

	Maximum Value	Minimum Value	Average		
Background Well					
Compliance Well #1					
Compliance Well #2					
Compliance Well #3					
Compliance Well #4					
Compliance Well #5					

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	Temperature
Applicable GW Standard (if none leave blank):	
Concentration Units (all data):	°C

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	16.9	16.1	16.5	17.3	16.8	16.4
2	9/8/2006	22.4	21.1	21.0	22.5	22.8	24.6
3	10/1/2006	15.8	17.6	17.3	17.3	17.9	15.6
4	2/28/2007	9.8	13.0	11.9	9.9	14.0	10.2
5	5/30/2007	17.3	15.5	15.2	19.4	15.7	18.8
6	9/27/2007	23.5	21.7	22.1	23.0	22.1	25.7
7	11/29/2007	18.8	20.1	19.1	19.1	19.5	19.0
8	3/25/2008	11.3	13.2	12.8	12.8	13.6	11.7
9	4/1/2008	16.0	15.2	15.5	16.4	16.3	16.5
10	8/29/2008	19.1	19.6	19.6	22.1	19.7	24.6
11	12/4/2008	14.5	16.1	16.2	13.7	16.9	15.0
12	1/1/2009	11.3	13.0	12.1	9.0	13.0	11.2
13	4/1/2009	15.2	15.4	14.7	16.7	16.0	15.8
14	8/31/2009	16.3	15.1	15.6	16.1	16.3	16.4
15	12/17/2009	9.8	12.3	12.7	10.8	12.5	9.0
16	1/1/2010	12.4	12.2	14.1	11.6	13.7	12.7
17	4/1/2010	14.6	11.9	11.5	11.6	12.4	12.6
18	7/1/2010	21.6	18.2	18.7	22.4	21.4	22.3
19	10/1/2010	13.9	15.9	15.0	14.1	16.0	14.5
20	2/28/2011	8.5	10.8	9.3	8.6	11.7	10.5
21	5/19/2011	14.6	13.2	12.5	14.3	14	14.6
22	8/18/2011	22	18.8	19.3	20.9	17.4	21.1
23	12/28/2011	10.4	13.6	12.6	11	13.9	12.7
24	3/15/2012	9.4	11.5	10.6	10.8	11.5	10.1
25	6/14/2012	19.13	18.62	18.65	18.7	18.5	19.02
26	9/5/2012	24.9	19.9	20.1	20.4	19.5	24.8
27	12/3/2012	15.48	18.14	17.53	14.47	18.71	17.01
28	3/5/2013	10.4	12.9	12.9	10.6	14	11.8
29	6/6/2013	19.06	15.38	14.9	19.7	15.58	19.11
30	9/3/2013	21.42	19.87	18.66	23.1	19.7	24.25
31	12/3/2013	13.67	17.11	17.12	13.58	17.96	15.66
32	3/6/2014	8.35	12.28	10.76	7.82	12.85	8.37
33	6/3/2014	17.84	14.65	15.23	17.73	14.77	17.66
34	9/3/2014	22.14	18.8	19.37	22.25	18.57	23.05
35	12/9/2014	13.71	16.22	16.16	14.29	17.23	15.05
36	3/13/2015	7.58	11.48	11.23	8.43	12.08	7.49
37	6/24/2015	24.56	18.36	17.76	24.49	20.44	25.09
38	9/3/2015	22.54	20.15	19.4	22.72	20.42	25.05
39	12/8/2015	14.97	17.82	17.12	14.6	17.95	16.5
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Not Significant	Not Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	0.000151135	0.032362867	Slight Increase	Very Weak
Compliance Well #1	-1.1026E-05	-0.003770389	Slight Decrease	Very Weak
Compliance Well #2	-0.000101477	-0.03277436	Slight Decrease	Very Weak
Compliance Well #3	-4.57661E-05	-0.009813732	Slight Decrease	Very Weak
Compliance Well #4	-7.25971E-05	-0.024894421	Slight Decrease	Very Weak
Compliance Well #5	0.00024059	0.047831745	Slight Increase	Very Weak

	Groundwater Standard		Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well					39
Compliance Well #1					39
Compliance Well #2					39
Compliance Well #3					39
Compliance Well #4					39
Compliance Well #5					39

	Maximum Value	Minimum Value	Average		
Background Well	25	8	16		
Compliance Well #1	22	11	16		
Compliance Well #2	22	9	16		
Compliance Well #3	24	8	16		
Compliance Well #4	23	12	16		
Compliance Well #5	26	7	17		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein
Permit No.:	VA0003867
Monitoring Parameter:	TOC
Applicable GW Standard (if none leave blank):	10
Concentration Units (all data):	mg/L

Well Designation ►	Data Entry						
	Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5
1	4/1/2006	2.2	1.4	2.1	1.1	<1	1.9
2	9/8/2006	1.5	71	3.5	3.6	2.4	2.7
3	10/1/2006	1.6	3.1	2.9	1.5	2.3	3
4	2/28/2007	1.3	2.7	3.4	2.1	1.8	1.8
5	5/30/2007	1.9	3.1	4.8	2.5	2.1	4.5
6	9/27/2007	1.5	2.6	4.6	3	3.4	3.9
7	11/29/2007	1.4	3.6	4.3	1	1.9	2.1
8	3/25/2008	1.4	6.9	5.5	2.1	2.7	2.4
9	4/1/2008	1.8	5.9	4.8	2.1	2.2	1.7
10	8/29/2008	1.5	4.1	4.1	2.1	2.1	2.1
11	12/4/2008	1.6	17.8	5.3	2.5	2.1	2.3
12	1/1/2009	1.9	5.1	4.7	2.4	2.1	2.5
13	4/1/2009	1.8	7.4	4.4	2.4	2	2.5
14	8/31/2009	1.8	36.7	4.3	1.7	2.1	2.1
15	12/17/2009	1.2	29.2	4.2	1.2	2.5	1.8
16	1/1/2010	1.1	19.8	4.4	1.1	2.6	6.3
17	4/1/2010	2.6	43	4.8	1	1.1	2.9
18	7/1/2010	3.9	55.2	4.9	1.7	1.2	2.8
19	10/1/2010	2.8	27.5	3.5	1.5	2.6	4.1
20	2/28/2011	2.5	8.1	2.9	1.2	2.3	1.8
21	5/19/2011	3.5	41.7	2.3	1.4	2.2	14.8
22	8/18/2011	2.3	10.2	2.9	1.9	2.1	2.1
23	12/28/2011	1.8	19.3	2.7	1.1	1.91	1.4
24	3/15/2012	2.2	18.2	4.1	1.9	2.2	5.1
25	6/14/2012	3.1	9.8	5.8	2	<1	3.6
26	9/5/2012	<1	3.5	2.5	<1	<1	1
27	12/3/2012	2	10.2	<1	<1	<1	<1
28	3/5/2013	1.3	42	6.6	1.5	1.8	3.5
29	6/6/2013	<1	7.9	<1	<1	<1	<1
30	9/3/2013	4.8	18.7	16.2	6.9	2.7	7.2
31	12/3/2013	3.05	31.2	7.15	5.07	2.04	3.61
32	3/6/2014	2.96	37.4	8.54	4.06	2.74	5.3
33	6/3/2014	2.93	42.5	17.6	6.1	4.93	5.56
34	9/3/2014	4.29	28.3	10	5.14	2.42	4.67
35	12/9/2014	2.57	70.2	9.99	2.28	2.58	4.14
36	3/13/2015	2.56	44.4	17.4	3.53	3.81	5.89
37	6/24/2015	3.03	45.8	2.59	2.07	3.65	5.65
38	9/3/2015	3.02	20.6	8.36	2.77	2.26	3.89
39	12/8/2015	3.61	30.5	11.8	5.68	2.93	3.66
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

	Distribution Tests		Non-normal Test	Normal Tests	
	Shapiro-Wilk Normality Test	Shapiro-Wilk Log-Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal	Not normal		N/A	
Compliance Well #1	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #2	Not normal	Not normal	Not Significant	Significant	Significant
Compliance Well #3	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #4	Not normal	Not normal	Not Significant	Not Significant	Not Significant
Compliance Well #5	Not normal	Not normal	Not Significant	Significant	Significant

	Regression Line Slope	Pearson Correlation (R)	Results: Linear Regression Trend Analysis and Interpretation	
			Linear Trend	Degree of Data Linearity
Background Well	0.000517182	0.533751134	Slight Increase	Moderately Strong
Compliance Well #1	0.007602413	0.416883752	Slight Increase	Moderately Weak
Compliance Well #2	0.002038215	0.520013134	Slight Increase	Moderately Strong
Compliance Well #3	0.000582202	0.390625068	Slight Increase	Moderately Weak
Compliance Well #4	0.000204667	0.231925146	Slight Increase	Very Weak
Compliance Well #5	0.000658767	0.281627707	Slight Increase	Moderately Weak

Groundwater Standard	Groundwater Criteria		Total No. of Data Points
	No. Violations of GW Standard	% Violations of GW Standard	
Background Well	0	0%	38
Compliance Well #1	24	61.5%	39
Compliance Well #2	5	12.8%	39
Compliance Well #3	0	0%	39
Compliance Well #4	0	0%	39
Compliance Well #5	1	2.6%	39

Maximum Value	Minimum Value	Average	Results: Basic Statistics (less-than values ignored)		
			Median	StDev	N
Background Well	5	1	2		
Compliance Well #1	71	1	23		
Compliance Well #2	18	2	6		
Compliance Well #3	7	1	3		
Compliance Well #4	5	1	2		
Compliance Well #5	15	1	4		

Groundwater Monitoring Data Analysis (v.3)

Facility Name:	Omega Protein, Inc.						
Permit No.:	VA0003867						
Monitoring Parameter:	Turbidity						
Applicable GW Standard (if none leave blank)							
Applicable GW Criteria (if none leave blank):							
Concentration Units (all data):	NTU						
Data Entry							
Well Designation ►							
Sample or Report Date (ascending)	Background Well Data	Compliance Well #1	Compliance Well #2	Compliance Well #3	Compliance Well #4	Compliance Well #5	
1	4/1/2008	14.23	51.7	14	0.01	NR	14
2	8/29/2008	48.4	542	38.9	18.9	84	5
3	12/4/2008	44.6	441	32.3	16.5	109	3.2
4	1/1/2009	34.2	23.1	7.76	21.7	345	21.3
5	4/1/2009	15.7	6.27	10.89	15.8	6.4	5.63
6	8/31/2009	50	11.18	11.76	20	185	70
7	12/17/2009	25.5	36.2	5.81	14.71	3.18	70.5
8	1/1/2010	28	37.3	6.3	20.2	11.1	87
9	4/1/2010	7.3	21.1	6.61	50.1	13.99	11.25
10	7/1/2010	12.9	7.08	32.7	7.83	3.95	8.54
11	10/1/2010	3.06	121	NR	169	717	179
12	2/28/2011	73.1	47.5	65.3	27.9	48.2	62
13	5/19/2011	133	431	554	590	986	370
14	8/18/2011	5.48	29.7	15.08	11.8	3.29	44.1
15	12/28/2011	2.03	11.07	11.99	10.94	3.47	12.72
16	3/15/2012	67.8	88.5	34.9	8.22	17.1	16.3
17	6/14/2012	0	0	0	58.3	0	0
18	9/5/2012	0	0	0	0	0	0
19	12/3/2012	6.8	44.3	85.9	62	76.2	31.9
20	3/5/2013	10.2	153	80.9	79.1	178	70
21	6/6/2013	15.4	18.2	50.2	28.5	43.6	11.3
22	9/3/2013	45	12.5	38.8	22.2	46	27.8
23	12/3/2013	23.6	34.1	52.8	106.8	60.7	12.9
24	3/6/2014	27.8	54.8	131	72.4	27.6	56.9
25	6/3/2014	5.64	66.3	39.5	118	48.1	22.3
26	9/3/2014	27.8	67.7	28.6	43.9	42.8	12.1
27	12/9/2014	12.94	84.97	71.98	125	109.5	27.5
28	3/13/2015	0	43.8	103	106.4	47.2	0
29	6/24/2015	8.25	42.2	45	54.1	11.16	61.1
30	9/3/2015	38.7	105.8	39	55.6	49	2.63
31	12/8/2015	22.2	60.1	92.6	12.9	45.7	13.2
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

Results: Significance to Background **				
Distribution Tests		Non-normal Test	Normal Tests	
Shapiro-Wilk Normality Test	Shapiro-Wilk Log Normality Test	Wilcoxon Rank Sum Test	T-test	T-test (lognormal)
Background Well	Not normal		N/A	
Compliance Well #1	Not normal		Not Significant	Significant
Compliance Well #2	Not normal		Not Significant	Not Significant
Compliance Well #3	Not normal		Not Significant	Significant
Compliance Well #4	Not normal		Not Significant	Significant
Compliance Well #5	Not normal		Not Significant	Not Significant

** Please note that the above cells will appear blank in cases where a test cannot be conducted due to lack of data, or if the test assumptions are invalid due to lack of data variation.

Results: Linear Regression Trend Analysis and				
Regression Line Slope	Pearson Correlation (R)	Interpretation		Degree of Data Linearity
		Linear Trend		
Background Well	-0.006746097	-0.204661501	Slight Decrease	Very Weak
Compliance Well #1	-0.043064804	-0.272752384	Slight Decrease	Moderately Weak
Compliance Well #2	0.015669315	0.134671889	Slight Increase	Very Weak
Compliance Well #3	0.014522701	0.115489076	Slight Increase	Very Weak
Compliance Well #4	-0.054465248	-0.205814009	Slight Decrease	Very Weak
Compliance Well #5	-0.010372711	-0.12349419	Slight Decrease	Very Weak

Groundwater Standard		Groundwater Criteria		Total No. of Data Points
No. Violations of GW Standard	% Violations of GW Standard	No. Violations of GW Criteria	% Violations of GW Criteria	
Background Well				31
Compliance Well #1				31
Compliance Well #2				30
Compliance Well #3				31
Compliance Well #4				30
Compliance Well #5				31

Results: Basic Statistics (less-than values ignored)				
Maximum Value	Minimum Value	Average		
Background Well	133.000	0.000	26.117	
Compliance Well #1	542.000	0.000	86.886	
Compliance Well #2	554.000	0.000	56.919	
Compliance Well #3	590.000	0.000	62.865	
Compliance Well #4	986.000	0.000	110.741	
Compliance Well #5	370.000	0.000	42.909	

ATTACHMENT M

NPDES Permit Rating Worksheet

NPDES PERMIT RATING WORK SHEET

NPDES NO. VA0003867

- Regular Addition
- Discretionary Addition
- Score change, but no status change
- Deletion

Facility Name: Omega Protein, Inc.

City: Northumberland County

Receiving Water: Cockrell Creek

Reach Number: _____

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?

1. Power output 500 MW or greater (not using a cooling pond/lake)
 2. A nuclear power plant
 3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate
- YES; score is 600 (stop here) NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

- YES; score is 700 (stop here)
 NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code:

Primary SIC Code: 2077 Other SIC Codes: none

Industrial Subcategory Code: 0 (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
<input type="checkbox"/> No process waste streams	0	0	<input type="checkbox"/> 3.	3	15	<input type="checkbox"/> 7.	7	35
<input checked="" type="checkbox"/> 1.	1	5	<input type="checkbox"/> 4.	4	20	<input type="checkbox"/> 8.	8	40
<input type="checkbox"/> 2.	2	10	<input type="checkbox"/> 5.	5	25	<input type="checkbox"/> 9.	9	45
			<input type="checkbox"/> 6.	6	30	<input type="checkbox"/> 10.	10	50

Code Number Checked: 1

Total Points Factor 1: 5

FACTOR 2: Flow/Stream Flow Volume (Complete either Section A or Section B; check only one)

Section A Wastewater Flow Only Considered

Section B Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Code	Points
Type I: Flow < 5 MGD	<input type="checkbox"/>	11
Flow 5 to 10 MGD	<input checked="" type="checkbox"/>	12
Flow > 10 to 50 MGD	<input type="checkbox"/>	13
Flow > 50 MGD	<input type="checkbox"/>	14
Type II: Flow < 1 MGD	<input type="checkbox"/>	21
Flow 1 to 5 MGD	<input type="checkbox"/>	22
Flow > 5 to 10 MGD	<input type="checkbox"/>	23
Flow > 10 MGD	<input type="checkbox"/>	24
Type III: Flow < 1 MGD	<input type="checkbox"/>	31
Flow 1 to 5 MGD	<input type="checkbox"/>	32
Flow > 5 to 10 MGD	<input type="checkbox"/>	33
Flow > 10 MGD	<input type="checkbox"/>	34

Wastewater Type (See Instructions)	Percent of instream Wastewater Concentration at Receiving Stream Low Flow	Code	Points
Type I/III:	< 10 %	<input type="checkbox"/>	41
	10 % to < 50 %	<input type="checkbox"/>	42
	> 50 %	<input type="checkbox"/>	43
Type II:	< 10 %	<input type="checkbox"/>	51
	10 % to < 50 %	<input type="checkbox"/>	52
	> 50 %	<input type="checkbox"/>	53

Outfall 002: 0.160 MGD (maximum 30 day)

Outfall 995: 6.821 MGD (maximum 30 day)

Total: 6.981 MGD

Code Checked from Section A or B: 12

Total Points Factor 2: 10

SECTION IN – INDUSTRIAL

FACTOR 3: Conventional Pollutants
(only when limited by the permit)

NONE – Monitoring only

NPDES NO: VA0003867

A. Oxygen Demanding Pollutant: (check one)

BOD COD Other: _____

Permit Limits: (check one)			Code	Points	
			< 100 lbs/day	1	0
	<input type="checkbox"/>		100 to 1000 lbs/day	2	5
	<input checked="" type="checkbox"/>		> 1000 to 3000 lbs/day	3	15
	<input type="checkbox"/>		> 3000 lbs/day	4	20

Code Checked: 3 _____

B. Total Suspended Solids (TSS)

Permit Limits: (check one)			Code	Points	
			< 100 lbs/day	1	0
	<input checked="" type="checkbox"/>		100 to 1000 lbs/day	2	5
	<input type="checkbox"/>		> 1000 to 5000 lbs/day	3	15
	<input type="checkbox"/>		> 5000 lbs/day	4	20

Code Checked: 2 _____

C. Nitrogen Pollutant: (check one)

Ammonia Other: _____

Nutrient GP allocates 21,213 lbs/yr of TN @ 198 operating days/yr = 107 lbs/day

Permit Limits: (check one)			Nitrogen Equivalent	Code	Points
			< 300 lbs/day	1	0
	<input type="checkbox"/>		300 to 1000 lbs/day	2	5
	<input type="checkbox"/>		> 1000 to 3000 lbs/day	3	15
	<input type="checkbox"/>		> 3000 lbs/day	4	20

Code Checked: 1 _____

Points Scored: 0 _____

Total Points Factor 3: 20 _____

FACTOR 4: Public Health Impact

Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

YES (If yes, check toxicity potential number below)

NO (If no, go to Factor 5)

Determine the *human health* toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
<input type="checkbox"/> No process waste streams	0	0	<input type="checkbox"/> 3.	3	0	<input type="checkbox"/> 7.	7	15
<input type="checkbox"/> 1.	1	0	<input type="checkbox"/> 4.	4	0	<input type="checkbox"/> 8.	8	20
<input type="checkbox"/> 2.	2	0	<input type="checkbox"/> 5.	5	5	<input type="checkbox"/> 9.	9	25
			<input type="checkbox"/> 6.	6	10	<input type="checkbox"/> 10.	10	30

Code Number Checked: _____

Total Points Factor 4: 0 _____

SECTION IN – INDUSTRIAL

FACTOR 5: Water Quality Factors

NPDES NO. VA0003867

- A. Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge:

<input checked="" type="checkbox"/>	Yes	Code 1	Points 10
<input type="checkbox"/>	No	2	0

- B. Is the receiving water in compliance with applicable water quality standards for pollutants that are water quality limited in the permit?

<input checked="" type="checkbox"/>	Yes	Code 1	Points 0
<input type="checkbox"/>	No	2	5

- C. Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?

<input checked="" type="checkbox"/>	Yes	Code 1	Points 10
<input type="checkbox"/>	No	2	0

Code Number Checked: A 1 B 1 C 1

Points Factor 5: A 10 + B 0 + C 10 = 20 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

- A. Base Score: Enter flow code here (from Factor 2): 12

Enter the multiplication factor that corresponds to the flow code: 0.05

Check appropriate facility HPRI Code (from PCS):

HPRI#	Code	HPRI Score	Flow Code	Multiplication Factor
<input type="checkbox"/>	1	1	20	11, 31, or 41
<input type="checkbox"/>	2	2	0	12, 32, or 42
<input checked="" type="checkbox"/>	3	3	30	13, 33, or 43
<input type="checkbox"/>	4	4	0	14 or 34
<input type="checkbox"/>	5	5	20	21 or 51 22 or 52 23 or 53 24

HPRI code checked: 3

Base Score: (HPRI Score) 30 X (Multiplication Factor) 0.05 = 1.5 (TOTAL POINTS)

- B. Additional Points NEP Program

For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

	Code	Points
<input checked="" type="checkbox"/> Yes	1	10
<input type="checkbox"/> No	2	0

- C. Additional Points Great Lakes Area of Concern

For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see Instructions)

<input type="checkbox"/>	Yes	Code 1	Points 10
<input checked="" type="checkbox"/>	No	2	0

Code Number Checked:

A 3 B 1 C 2

Points Factor 6: A 1.5 + B 10 + C 0 = 11.5 TOTAL

SECTION IN – INDUSTRIAL

SCORE SUMMARY

NPDES NO. VA0003867

Factor	Description	Total Points
1	Toxic Pollutant Potential	<u>5</u>
2	Flows/Streamflow Volume	<u>10</u>
3	Conventional Pollutants	<u>20</u>
4	Public Health Impacts	<u>0</u>
5	Water Quality Factors	<u>20</u>
6	Proximity to Near Coastal Waters	<u>11.5</u>
TOTAL (Factors 1 through 6)		<u>66.5</u>

S1. Is the total score equal to or greater than 80? Yes (Facility is a major) No

S2. If the answer to the above questions is no, would you like this facility to be discretionary major?

No

Yes (Add 500 points to the above score and provide reason below:

Reason:

NEW SCORE: 66.5

OLD SCORE: 60

Laura Galli

Permit Reviewer's Name

(804) 527-5095

Phone Number

February 11, 2016

Date

ATTACHMENT N

VDH, VDH-DSS, DCR-DNH and USFWS Coordination Responses

RECEIVED PRO
FEB 22 2016



COMMONWEALTH of VIRGINIA

Marissa J. Levine, MD, MPH, FAAPP
State Health Commissioner

John J. Aulbach II, PE
Director, Office of Drinking Water

DEPARTMENT OF HEALTH
OFFICE OF DRINKING WATER

Southeast Virginia Field Office

830 Southampton Avenue
Suite 2058
Norfolk, VA 23510
Phone (757) 683-2000
Fax (757) 683-2007

DATE:

FEB 17 2016

FROM:

Daniel B. Horne, PE
Engineering Field Director

TO:

Laura Galli
VPDES Permit Writer
DEQ Piedmont Regional Office
4949A Cox Road
Glen Allen, Virginia 23060

CITY/COUNTY:

Northumberland County

APPLICANT:

Omega Protein, Inc.

PERMIT TYPE:

VPDES

APPLICATION TYPE:

Re-Issuance (Existing)

PROJECT:

Omega Protein, Inc.-Reedville

SUBJECT:

Review response for DEQ's permit application VA0003867

Our office has reviewed the application for impacts to surface waters associated with discharges from the Omega Protein treatment facility.

No public raw water intakes in Virginia were found downstream (or upstream) from the discharge point/area.

RSH/DBH/shb

cc: VDH, ODW – Central Office
VDH, Northumberland County Health Department
Andy Hall, General Manager, Omega Protein, Inc.

R:\DIST20B\Northumberland\NON COMMUNITY SYSTEMS\Omegamega Protein Inc\Omegamega Protein VPDES 2016.docx

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director



Rochelle Altholz
Deputy Director of Administration and Finance

David C. Dowling
Deputy Director of Soil and Water Conservation and Dam Safety

Thomas L. Smith
Deputy Director of Operations

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: March 17, 2016

TO: Laura Galli, DEQ-PRO

FROM: Alli Baird, DCR-DNH

SUBJECT: VA0003867, Omega Protein, Inc. Permit Reissuance
Due March 17, 2016

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from <http://vafwis.org/fwis/> or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

Thank you for the opportunity to comment on this project.

Galli, Laura (DEQ)

From: Susan Lingenfelser [susan_lingenfelser@fws.gov]
Sent: Friday, March 04, 2016 8:35 AM
To: Galli, Laura (DEQ)
Subject: RE: VPDES Permit No. VA0003867 - Omega Protein - USFWS Coordination

Good Morning Laura,

We have reviewed the information for the reissuance of the VPDES Permit No. VA0003867, Omega Protein. Based on the study description and location, it appears that no impacts to federally listed species or designated critical habitat will occur, and we have no further comment.

Respectfully,

Susan Lingenfelser

From: Galli, Laura (DEQ) [mailto:Laura.Galli@deq.virginia.gov]
Sent: Tuesday, February 16, 2016 4:06 PM
To: susan_lingenfelser@fws.gov
Subject: VPDES Permit No. VA0003867 - Omega Protein - USFWS Coordination

Ms. Lingenfelser,

Please see attached the coordination form for the reissuance of the VPDES Permit No. VA0003867, Omega Protein. The permit application and 2011 permit and fact sheet can be found at this link:
<http://www.deq.virginia.gov/fileshare/wps/VA0003867>.

If you have any questions regarding these documents, please do not hesitate to contact me.

Thank you,
Laura

Laura Galli
VPDES Permit Writer
Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Rd
Glen Allen, Virginia 23060
Ph. (804) 527-5095
laura.galli@deq.virginia.gov

ATTACHMENT O

316(b) Interim BTA Questionnaire and CWIS photographs

Archived: Monday, June 27, 2016 11:46:40 AM
From: Bill Purcell
Sent: Wednesday, June 22, 2016 12:10:19 PM
To: Galli, Laura (DEQ)
Cc: Andy Hall; Burton Thrift; Bill Purcell; Carl Hubeny
Subject: RE: Omega 316(b) rule
Importance: Normal
Attachments:
[IMG_0400.jpg](#)

Laura,

We cut the top out of our discharge pipe this morning so we could measure the pipe volume and the pipe had 15.5 inches of flow in a 17 ID pipe with little slope. We plugged this into the Manning formula and came up with 5.4 mgd which obviously is greater than the 2.0 mgd criteria. What caused the confusion here was looking at the discharge which was 3-4 inches full (photo attached). Therefore we fall under 316(b).

Our plans are to install a new steam dryer and cooling tower in the up-coming off season and take two of the three existing steam dryers out of service. We will condense the vapors from the existing and new steam dryer in the new cooling tower. The cooling tower will operate like the existing cooling tower and use evaporator condensate and well water as feed water. Use of creek water as a cooling source will cease after this season.

You also asked why our cooling needs have decreased. The creek water was used to condense vapors from the Esmital waste heat evaporator and the steam dryers. With the addition of our new WHE and the age of the Esmital evaporators the Esmital evaporators were taken out of service.

I hope this clarifies the issues and I apologize for the confusion on my part.

Bill Purcell
Environmental Manager

Omega Protein, Inc.
610 Menhaden Road
Reedville, VA 22539
Phone 804.453.4211 ext 6262 | **Fax** 804.453.4123
Email bpurcell@omegaprotein.com | <http://www.omegaprotein.com>

CONFIDENTIALITY STATEMENT

This message from Omega Protein Corporation may contain information or advice which is confidential or privileged and is solely for the use of the intended recipient. All proprietary rights including copyright, are specifically reserved. If you are not the intended recipient, be aware that any disclosure, copying, distribution or use is prohibited. If you have received this communication in error, please notify us immediately by phone (713) 623-0060 or by e-mail.

From: Galli, Laura (DEQ) [mailto:Laura.Galli@deq.virginia.gov]
Sent: Tuesday, June 21, 2016 4:45 PM
To: Bill Purcell
Cc: Andy Hall; Burton Thrift; Thomas Evans; Montgomery Deihl
Subject: Omega 316(b) rule

Bill, please see comments below in reference to your 5/24/16 letter, and to the 316(b) rule in general:

- 1) Please note that because Omega withdraws waters of the U.S., and all or a portion of that is used for cooling purposes, the facility is still subject to 316(b). However, if the cumulative design intake flow (DIF) of the facility's cooling water intake structures is \leq 2 MGD, then it is not subject to the requirements of 40CFR §§125.94 through 125.99 --- which includes the submittal of 40CFR §122.21(r). However, please note that even though the Rule infers facilities \leq 2 MGD DIF may be excluded from the need to provide the 40CFR §122.21(r) information, both the Rule and the State Water Control Law provide DEQ staff with the authority to require additional information from the applicant – i.e., which may include, and is not limited to, the information outlined in 40CFR §122.21(r).
- 2) The letter references the use of the Manning equation to evaluate maximum pump capacity. The Manning's equation was originally intended for use in the design of open channel flow, but has since also been used in pipe design. By referencing the Manning's equation, Omega's letter would infer the most limiting factor in establishing the design flow capacity of their cooling water intake structure may be their pipe network or intake port, rather than their pump capacity. In light of what explained in item 1) above, **please provide manufacturing documentation, specs, calculations to demonstrate that the new intake structure capacity cannot exceed 2MGD. This should also be supported by a narrative description on why the facility's cooling water needs have decreased.**
- 3) The facility falls under the requirements of 40CFR §125.90(b), which will require DEQ staff to evaluate, on a "...case-by-case, best professional judgment basis," whether the "...location, design, construction, and capacity of [their] cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." The facility's 2016 Fact Sheet will consequently need to include narrative of a staff "finding" that adverse environmental impacts have been minimized. While not necessarily conclusive, operation of a closed-loop re-circulating cooling system goes a long way toward minimizing adverse impacts, and is generally used in the Rule as the control technology in which to compare against all others. Closed-loop systems do not completely *eliminate* the potential for adverse impacts (and in some cases additional control measures may be warranted), but they're a great starting point.

Please let me know should you have any questions, or if you would like to discuss.

Laura

Laura Galli

VPDES Permit Writer
Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Rd
Glen Allen, Virginia 23060
Ph. (804) 527-5095
laura.galli@deq.virginia.gov

Disclaimer

The information contained in this communication from the sender is confidential. It is intended solely for use by the recipient and others authorized to receive it. If you are not the recipient, you are hereby notified that any disclosure, copying, distribution or taking action in relation of the contents of this information is strictly prohibited and may be

unlawful.

This email has been scanned for viruses and malware, and may have been automatically archived by **Mimecast Ltd**, an innovator in Software as a Service (SaaS) for business. Providing a **safer** and **more useful** place for your human generated data. Specializing in; Security, archiving and compliance. To find out more [Click Here](#).



Healthy Products for a Healthy World®

May 24, 2016

Ms. Laura Galli
Virginia Dept of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

Re: 316b Questionnaire

Dear Ms. Galli:

Attached is the 316b questionnaire. We installed new pumps in the off-season and based on very conservative calculations using the Manning equation the maximum flow from each pump is 500 gpm which is well below the 2.0 MGD to qualify for the 316b program. In the upcoming offseason we plan to take the two small steam dryers offline and install a single larger steam dryer with a cooling tower sufficient to handle two of the new larger steam dryers. In the 2018-19 offseason we will replace the old steam dryer and cease the cooling water withdrawal from the creek.

Contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "will Purcell".

William Purcell
Environmental Manager
Omega Protein, Inc.

1. Does your facility currently employ any of the following measures to reduce impingement mortality and entrainment? (Check all that may apply):
 - Closed-cycle re-circulating cooling water system
 - Variable speed pumps
 - Seasonal flow reductions
 - Wastewater reclamation/reuse
 - Intakes with maximum design through-screen velocities of 0.5 feet per second, or less
 - Intakes with actual through-screen velocities operated at 0.5 feet per second, or less
 - Existing offshore velocity caps
 - Modified traveling screens
 - Intake screen mesh materials with maximum opening sizes of 0.56-inch (14 millimeters), or less
 - Cylindrical wedgewire screens
 - Barrier nets
 - Aquatic Filter Barriers
 - Other *1/4" expanded stainless steel intake screen*

Please provide details on any measures that are currently being employed including the number, size, and orientation of the cooling water intake structures.

2. Within the next 5-10 years, does your facility plan to employ or install any of the following measures to reduce impingement mortality and entrainment? (Check all that may apply):
 - Closed-cycle re-circulating cooling water system
 - Variable speed pumps
 - Seasonal flow reductions
 - Wastewater reclamation/reuse
 - Intakes with maximum design through-screen velocities of 0.5 feet per second, or less
 - Intakes with actual through-screen velocities operated at 0.5 feet per second, or less
 - Existing offshore velocity caps
 - Modified traveling screens
 - Intake screen mesh materials with maximum opening sizes of 0.56-inch (14 millimeters), or less
 - Cylindrical wedgewire screens
 - Barrier nets
 - Aquatic Filter Barriers
 - Other

Please provide details on any measures that the facility plans to employ.

3. Has your facility previously completed any studies relating to impingement mortality and/or entrainment at the cooling water intake structure?
 - Yes. Please provide the dates and names of the studies.
 - No.

4. Do you anticipate adding any new cooling systems at your facility in the next 5 years?

Yes. Please provide any details you have regarding the new cooling systems.

No
 Don't know

As we have discussed we are anticipating adding new cooling systems to our current system in the next 5 years. This is in last section we are at 125 MGD.

5. What is your current status in compiling the following information pursuant to 40 CFR §122.21(r)? Off-Season, Usic, Entainment Performance Studies, Previous Performance Studies, Operational Status
- (r)(2) Source water physical data
 - (r)(3) Cooling water intake structure data
 - (r)(4) Source water baseline biological characterization data
 - (r)(5) Cooling water system data
 - (r)(6) Chosen Method of Compliance with Impingement Mortality Standard
 - (r)(7) Previous Entrainment Performance Studies
 - (r)(8) Operational Status

6. For Facilities withdrawing more than 125 MGD:

- (r)(9) Entrainment Characterization Study
- (r)(10) Comprehensive Technical Feasibility and Cost Evaluation Study
- (r)(11) Benefits Valuation Study
- (r)(12) Non-water Quality Environmental and Other Impacts Study
- (r)(13) Peer Review of (r)(10), (11) and (12)

	Completed	Initiated	Not Yet Begun	Other
(r)(9)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(r)(10)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(r)(11)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(r)(12)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(r)(13)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Omega Protein, Inc. VA0003867 – Cooling Water Intake Structure



Photo 1: Metal barrier nets surrounding the cooling water intake.



Photo 2: Intake box and metal screen.

SCALE 1" = 4'

NET

38'

NET

NET

16'

Dock

Dock

expanded metal screen
4' wide x 6' deep



ATTACHMENT P

Owner Review Comments



July 19, 2016

Ms. Laura Galli, Permit Writer
Virginia Dept of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

Re: Permit VA0003867 – Comments on Draft Permit

Dear Ms Galli: *Laura Galli*.

First I would like to thank you for your assistance in working through the issues in developing the draft permit. This permit is a definite improvement over past permits. I do have a few comments and will address them as they appear in the permit.

Page 1 of 17 A. Limitations and Monitoring Requirements – The sample type for Oil and Grease should be a grab sample to comply with 40 CFR136.

Page 6 of 17 c. Total Phosphorus Reporting – Section treats data differently than all other in the permit. There is no scientific basis to use $\frac{1}{2}$ of the QL as a true value when <QL is the result.

Page 10 of 17 There is no 16 in the series.

Page 14 of 17 C 2. Section asks that whole effluent toxicity be conducted within the first month of the permit. This makes no sense. We have been conducting toxicity testing on a quarterly schedule we should maintain that schedule.

Page 14 of 17 C 6 – Why are there two quarterly schedules in the same permit? For our season which may have us operating one or two days in November the logistics of collecting all our required samples is problematic. Far more logical to have all quarterly samples on the same schedule and the Oct. Nov. Dec. quarter gives us the whole month to collect our required samples.

Page 15 of 17 D. a – Describes the cooling water system as a closed cycle recirculating cooling water system. A more accurate description is a once through cooling water system. Water is withdrawn from the creek and sent through the heat exchangers and promptly discharged. There is no recirculation.

Please contact me if you have any questions regarding this matter.

Sincerely,



William E. Purcell
Environmental Manager
Omega Protein, Inc.